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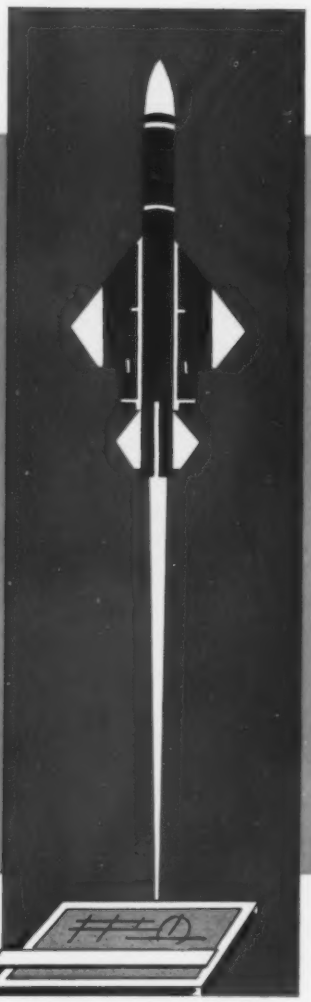

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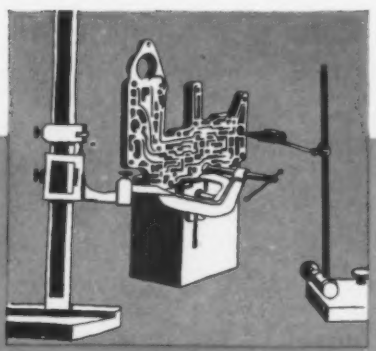

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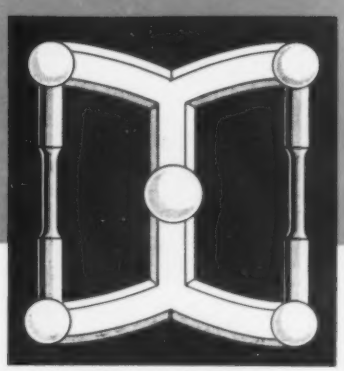

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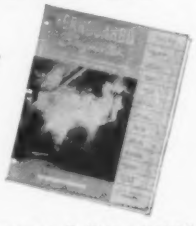

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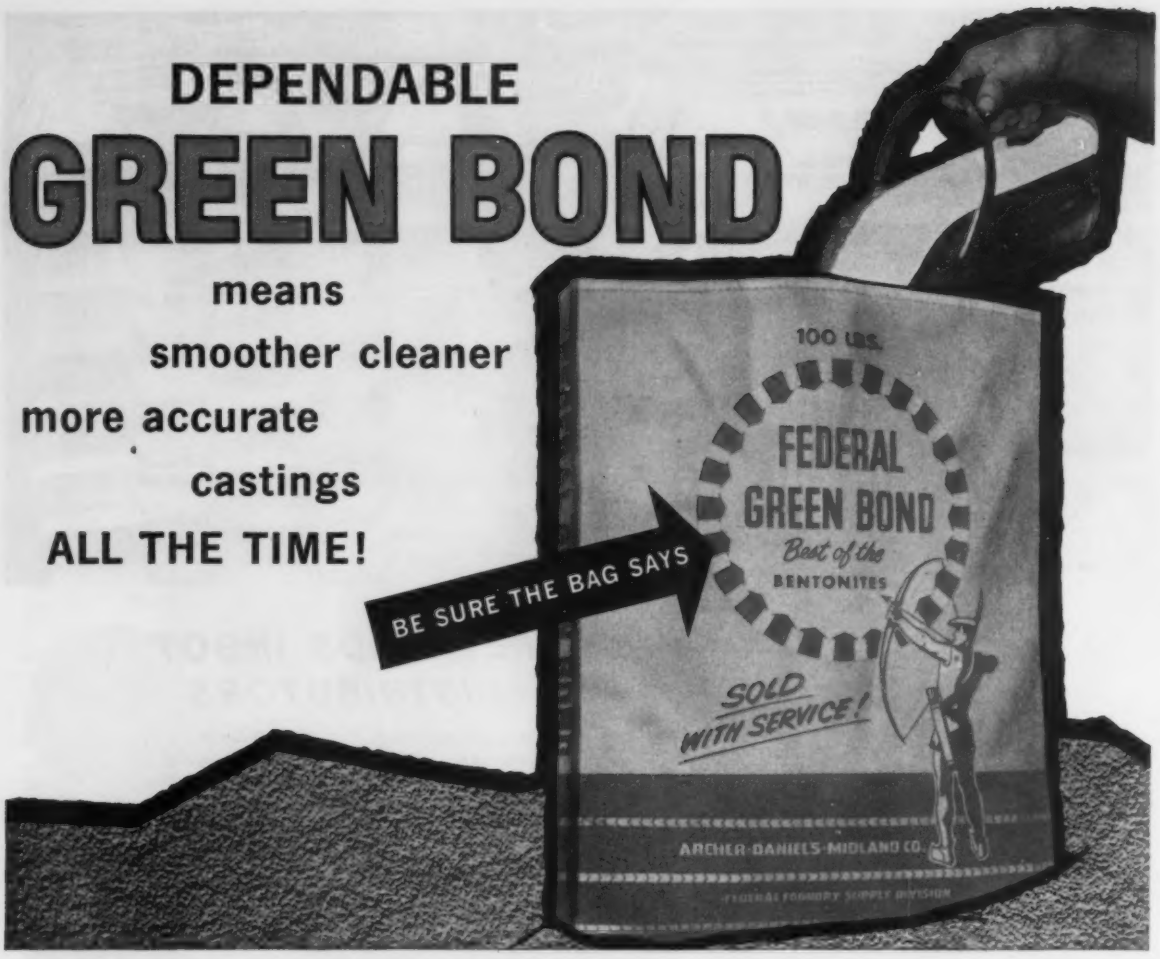

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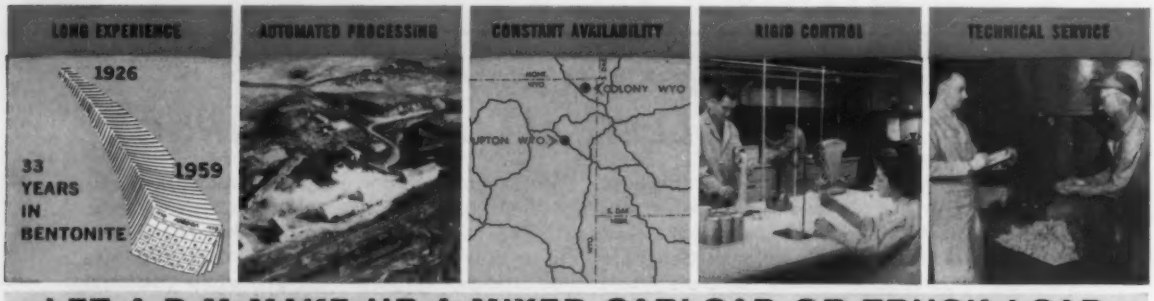

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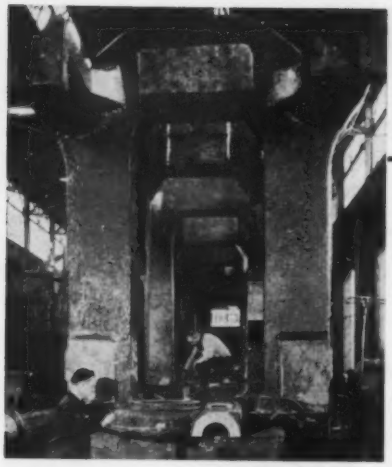

An arcade of steel castings is formed by these eight rolling mill housings at the East Chicago, Ind., plant of Blaw-Knox Co. Total weight is about 500 tons. The castings will house rolls of a modern structural mill.

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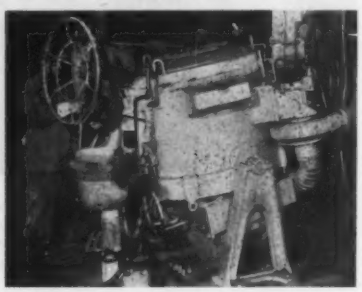
FOUNDRY is edited primarily for management, production, technical, and purchasing personnel in foundries. A copy is sent at no cost to each metal casting plant in the U. S. and Canada employing 20 or more workers and to selected smaller foundries. Additional copies are sent to each foundry to the extent necessary to serve all key foundry personnel on a personal or routed basis. A limited number of copies is supplied at no cost to educational institutions. Subscriptions in the U. S., possessions, and Canada for home-addressed copies and copies not qualified for under the above principles: One year, $10. Single copy, $1. Other countries: One year, $20. Single copy, $2. Published monthly and copyright 1959 by The Penton Publishing Co., Penton Building, Cleveland 13, Ohio. Accepted as controlled circulation publication at Cleveland, Ohio.

THE EDITORS' WORKSHOP

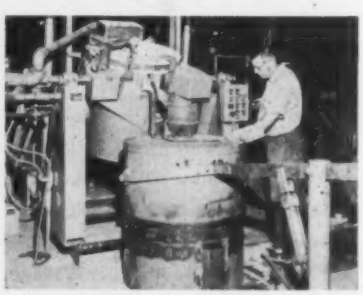
NEXT MONTH: Dayton Foundry of Hollydale, Calif., has been producing gray iron castings for 30 years. In 1957 it installed an induc-



tion melting furnace to supplement its supply of cupola metal. Operating practice and advantages and disadvantages of this type of unit in the gray iron foundry will be described in an article next month.

ALSO COMING: Here are titles of some other articles scheduled for coming months: "Barrel Finishing of Castings," "Mechanism of Graphitization in Fe-C-Si Alloys," "A New Experimental Cupola," "Effect of Zinc on Cupola Malleable Iron," "Core Practice in an Israelian Foundry," "How Should a Small Company Plan Ahead?" and "An Automatic Molding System."

CENTRIFUGALLY: For some applications the centrifugal process offers the best casting method. Gen-



eral Electric Co. decided this was the case when it chose centrifugal casting for providing motor rotors with aluminum bars, end rings, and fan blades. GE's highly efficient setup for performing this operation will be detailed in the August issue.

Report from Jim Coleman,
41-year veteran
Core Superintendent,
Wellman Bronze & Aluminum
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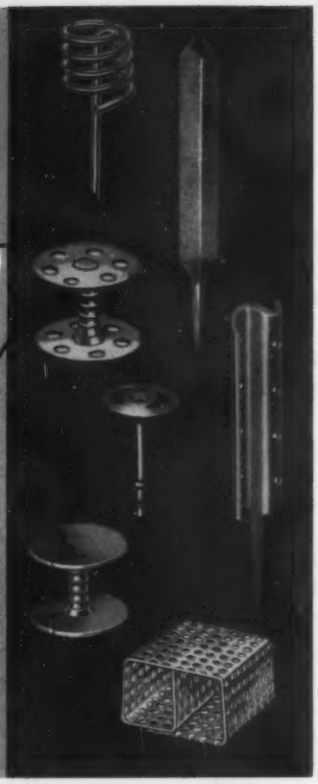

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With the Editors

● **A Bit of History:** I am indebted to Edward H. Dutcher, Edward H. Dutcher & Son, 1596 Westmoreland Ave., Syracuse, N. Y., for the original of the FOUNDRY receipt reproduced below. Mr. Dutcher wrote that he "came across this 'ancient' FOUNDRY subscription acknowledgment card the other day during one of my historical jaunts. Thought someone might like to preserve it. Would make an interesting picture piece for one of the offices."

Thank you Mr. Dutcher—George Pope, our business manager, thinks he will do just that with it.

FOUNDRY had just passed its 15th birthday when this receipt was issued. Being a little curious, I took the 1908 volume off the shelf and found that in the January issue the editors reported further reductions in foundry iron prices during the previous 30 days. Southern iron was quoted at $14, Birmingham, for No. 2 which, it was pointed out, was only a few dollars above the actual cost of production.

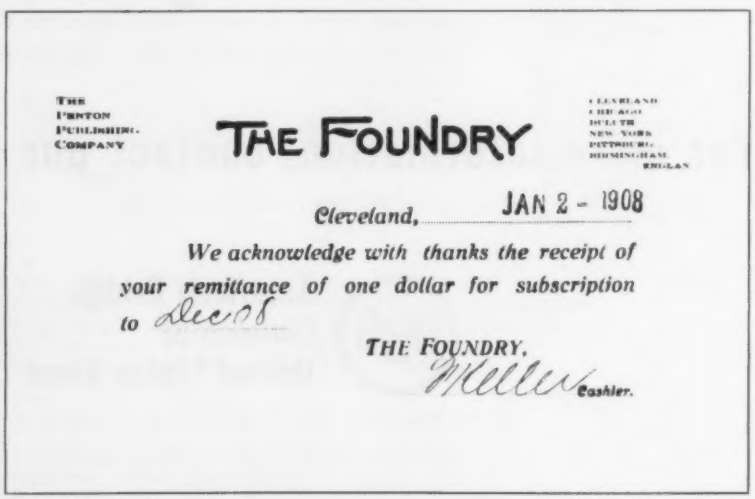
The issue reported that not more than 50 per cent of the gray iron, malleable iron, and steel producing capacity was operative, with a let-up in the cancellation of specifications the only bright feature of the general situation. A slow resumption of idle foundries was foreshadowed for early in the year 1908. Prices of all nonferrous metals had suffered a further decline, and 12-cent copper was anticipated.

Articles in that issue dealt with production of exceptionally fine ornamental bronze castings at the Henry Bonnard Bronze Co., Mt. Vernon, N. Y.; problems in making brass castings in a jobbing shop; patterns for repetitive work; a model jobbing pattern shop; a method for making a large bed plate; designing an iron foundry; charcoal iron for the iron foundry, and a cost system for jobbing foundries.

Many of the problems discussed in that issue are still with us. But some have long since been forgotten. Illustrations of foundry interiors and those used in advertisements of foundry equipment show the remarkable progress that has been made in foundry plant and equipment.

—o—

Flying Hazard: Two foundry suppliers boarded an airliner late one afternoon for a trip home. The plane crew announced that takeoff would be delayed because smoke was smelled and a fire on board was suspected. After more than a half-hour of fruitless search, dawn broke. One of the men asked the captain if the alleged smoke resembled the odor of the former's



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THE FOUNDRY

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All the different kinds of refractories for both acid and basic cupola operations are produced in various leading brands at Harbison-Walker plants in many states.

These comprise all the commercial classes of fireclay brick ranging from the highly siliceous to those of high alumina content, the full complement of high alumina brick, various monolithic refractories and the basic brick brands and ramming mixes which fulfill the requirements for basic operations.

Some typical Harbison-Walker cupola refractories are listed in the following.

For ACID Practice

In the stack, preheating zone, melting zone, well—and for back-up in all zones . . .

Harbison-Walker high duty fireclay brick brands provide the various combinations of properties especially needed for maximum service life. These are available for lowest transportation costs from plants in Pennsylvania, Maryland, Ohio, Kentucky, Alabama, California, Colorado, Texas and Missouri.

In the charging zone . . .

H-W EXTRA STRENGTH CASTABLE makes a hard strong refractory concrete lining which is extremely resistant to impact and abrasion. It is adequate for service at temperatures up to 2400°F.

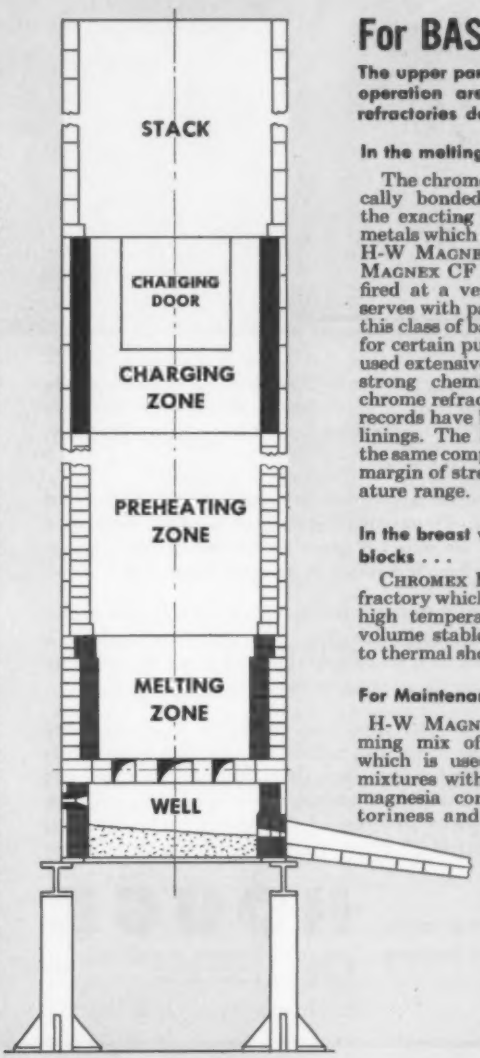
In the melting zone . . .

H-W KUPLOMIX forms monolithic linings free from vulnerable joints. It is highly siliceous and very resistant to the corrosive action of non-basic slags and to erosion by molten metal and slag.

In wells, spouts, tap holes, runners, breast walls, ladles . . .

H-W BLACK PATCH is a plastic graphite refractory of top high duty quality. APACHE G, the most refractory monolith-forming plastic, is a high-alumina graphite product. The oxidation inhibitors which these contain greatly retard burning of the carbon. When heated both develop a strong ceramic set and become dense and highly impervious. They withstand severe corrosive and erosive actions of various metals and slags, resist wetting and remain cleaner because of less slag adherence.

H-W BLACK PATCH and APACHE G are also made in preformed shapes which are used with special benefit in some of these applications.



For BASIC Practice

The upper part of cupolas used in basic operation are lined with the various refractories described for acid practice.

In the melting zone . . .

The chrome-free MAGNEX CF chemically bonded magnesite brick fulfills the exacting requirements for melting metals which must be free of chromium. H-W MAGNESITE is the equivalent of MAGNEX CF in composition but is prefired at a very high temperature and serves with particular advantage where this class of basic refractory is preferred for certain purposes. MAGNEX which is used extensively in this application, is a strong chemically bonded magnesite chrome refractory with which excellent records have been established in cupola linings. The hard fired MAGNEX B of the same composition provides an added margin of strength over a wide temperature range.

In the breast walls and for tap-out blocks . . .

CHROMEX B, a chrome-magnesite refractory which is burned at an extremely high temperature is very strong and volume stable and has high resistance to thermal shock, corrosion and erosion.

For Maintenance . . .

H-W MAGNAMIX is a granular ramming mix of high magnesia content which is used both by itself and in mixtures with other materials of lower magnesia content to increase refractoriness and chemical resistance to highly basic slags. It is readily applied by ramming and by air-gun placement.

HARBISON-WALKER REFRACTORIES CO.
AND SUBSIDIARIES
World's Most Complete Refractories Service
General Offices: Pittsburgh 22, Pennsylvania

Circle 561 on Page 53

"I vote for the H-25 PAYLOADER®"

"The new bucket breakout is very effective because it takes a bite that amounts to something," says Orlin Holm, Maintenance Foreman of Baker Manufacturing Co., Grey Iron Foundry, Evansville, Wisconsin.

"It also gives low load-carry position for better driver vision and faster, safer operation. Power-steering is also a great help in a crowded foundry such as ours. It gives the driver quicker, easier control and if a wheel hits something it doesn't throw him."

Baker's Model H-25 "PAYLOADER" unit is used both day and night. Daytimes it charges furnaces with iron, coke and lime and hauls out burned sand. At night it scoops up the sand from the pouring floor and feeds it to the cleaning-aerating unit.

No other tractor-shovel can give you so much carry capacity (2,500 lbs.) on so short a turning radius (6 ft.). Its power-shift transmission with 2 speed ranges each direction, torque converter drive and power-steer make it the easiest, safest operating machine for the job. Power transfer differential — another exclusive in its class — gives the Model H-25 better traction on loose or slippery footing.

Your Hough Distributor is ready with further facts about the new Model H-25.

HOUGH®

THE FRANK G. HOUGH CO.
LIBERTYVILLE, ILLINOIS
SUBSIDIARY — INTERNATIONAL HARVESTER COMPANY

THE FRANK G. HOUGH CO.
703 Sunnyside Ave.
Libertyville, Ill.

Send Model H-25 "PAYLOADER" data

Name _____
Title _____
Company _____
Address _____
City _____ State _____

7-A-2

clothes. It did, the search was stopped, and the plane took off.

The two men had spent the day in a shell mold foundry.

—o—

More Competition: The competition among materials grows more intense. Note the following from a recent news release of DuPont: "Delrin is a tough, rigid thermoplastic developed primarily for use in fields now dominated by die-cast metals. Over 75 per cent of its potential applications involve replacement of steel, brass, aluminum, and zinc. The incentive: Improved product design at less cost."

This is the type of thing that shouts for more research among foundries, regardless of the type of metal cast or the method of casting.

—o—

The President: Once every two months the Society of Business Magazine Editors holds a two-day meeting in Washington. The meeting is devoted to talks about editorial problems and to visits with some of the important people in government whose operations influence the readers of business magazines. I attended the June meeting when the big attraction was a visit with President Eisenhower at the White House. Many newspapers in the country carried reports on the President's informal talk to the editors.

In discussing the problem of inflation, the President got to reminiscing about his early financial struggle as a young lieutenant very much in love with his bride, Mamie.

He concluded his appealing talk with the following: "We are living in a time of prosperity that looks like it is assuming boom proportions. If now, today, we can't pay off some of the Federal debt, then our financing is going to have to be done under very unsatisfactory methods, to the damage of all of us. In the long run there will be inflation, there will be a further cheapening of our money, and it won't be the rich that will be suffering. Instead it will be all those millions who with their hands and brains, typewriters, shovels, and all the rest, are producing the wealth of the United States, and depending upon insurance and pension plans for old age security."

How true! How true!

F.G.S.

All Soffel's Products—

are BAGGED and PALLETIZED

to Cut Your Handling Costs

Wherever you see Soffel's Red Devil *there's real work being done!*

Soffel's

Easy to Handle—No Guesswork— Precise Measurement

To help you save handling time, storage space and labor costs, all Soffel's products are now available in strong 5-ply Kraft Bags—each product in a different color for quick identification with tops and bottoms sewn for extra re-inforcement.

Each Moisture Proof bag contains 50 pounds net weight of the world's best, easiest to handle, fluxes, purifiers, or exothermic compounds which give you precise on-the-spot measurement. There's no extra charge for this customer service.

For your further convenience, we will ship the material on pallets—one ton to the pallet for only $1.75 per pallet additional.

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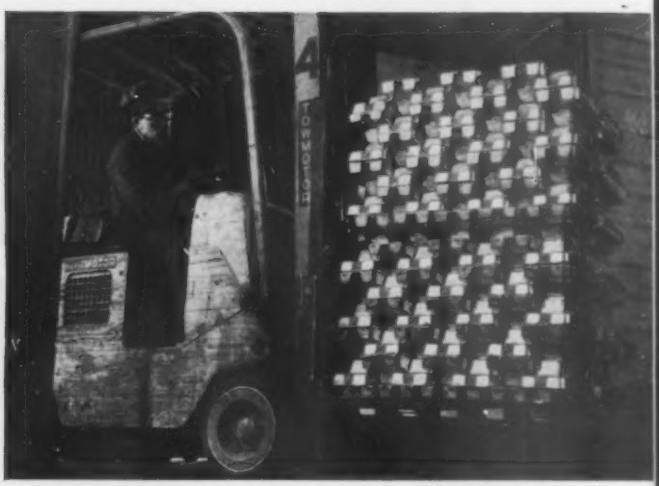
"WORLD'S LARGEST MANUFACTURER OF FLUXES, PURIFIERS AND EXOTHERMIC COMPOUNDS FOR ALL METALS AND ALLOYS"

Circle 563 on Page 53

New handling efficiency. Locking one to another to form stable, rigid loads, new Alcan TRI-LOK ingots give you easier, faster handling with a wide variety of equipment . . . safer, more compact stacking. Save time from car unloading to storage and furnace charging.

Distributors of Alcan Foundry Alloys: **Apex Smelting Co.,** Chicago, Cleveland, Los Angeles • **Charles Batchelder Co., Inc.,** Botsford, Conn.

Free standing. Alcan TRI-LOK ingot bundles maintain their rigidity and stability even when unbanded. This free-standing advantage is a real timesaver in carrying, storing and furnace charging. For Alcan TRI-LOK bundles need no pallets or special slings for pick-up, can be set right on the bare floor . . . safely.



Cuts unloading time. Alcan TRI-LOK bundles take the roughest handling. Interlocking design prevents "rolling" or "fingering" in transit . . . deep grooves keep straps tightly in place. The result: bundles arrive in excellent condition, ready for fast unloading by fork-lift truck. Alcan TRI-LOK bundles save checking time, too. Every bundle is a convenient one-ton, 40-ingot unit.

From Aluminium research . . .

ALCAN TRI-LOK ...a new ingot form especially designed to reduce your handling costs!

New TRI-LOK ingot is now available in complete range of ALCAN foundry alloys.

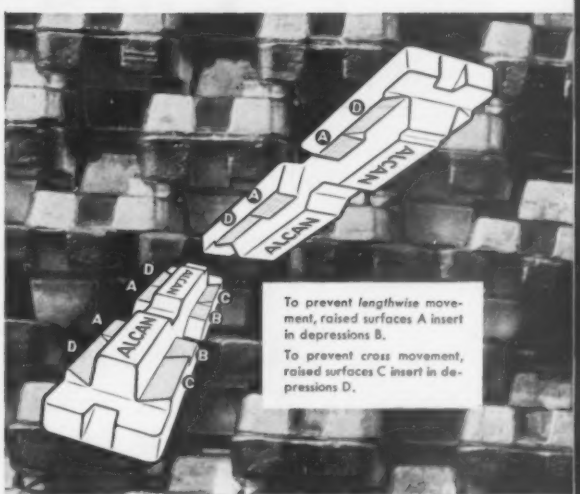
Here's a way to save time in every phase of ingot handling—the new Alcan TRI-LOK ingot!

Newest of Aluminium's ingot developments, Alcan TRI-LOK ingots are especially designed for faster, more efficient handling. You see this handling ease in the safe, stable way the new ingots bundle and stack—locking one to another, not in just one, but in three different ways. The result: measurable cost savings in car unloading, handling and storage operations.

For information on the new Alcan TRI-LOK design—or aluminum in any other ingot form—just call or write your nearest Aluminium Limited sales office.

Aluminium
Limited

Ingot Specialist...serving
American Aluminum Fabricators—



Exclusive 3-way interlock. The Alcan TRI-LOK design is unique in that it prevents lateral movement of any kind. Within the stack or bundle, ingots are "mated" one to another, actually locking in three different ways. Despite excellent stacking stability, there's never an unlocking problem. *Just lift to separate!*

In the U.S.—Aluminium Limited Sales, Inc., 630 Fifth Ave., New York 20, N. Y. CLEVELAND • CHICAGO • LOS ANGELES • DETROIT • ATLANTA

Circle 564 on Page 53

WHY PAY MORE

when you can buy the best binder at the lowest price!

INSIST ON STEINEX

the original CO_2 Binder available only from Carver

BEST QUALITY Steinex gives you absolutely the best shakeout —BY FAR!

BEST PRICE Steinex is 30% lower in cost than any other binder on the market!

BEST SERVICE Carver has the in-the-foundry experience and know-how to help you use Steinex in your CO_2 operation — successfully and profitably!

JOIN THE HUNDREDS OF FOUNDRIES THAT INSIST ON THE BEST

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RUSH information and prices on Steinex binders.

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CALENDAR of Meetings

Sept. 21-22—Steel Founders' Society of America, fall meeting, Homestead, Hot Springs, Va.

Sept. 21-25—Instrument Society of America, annual Instrument-Automation Conference and Exhibit, International Amphitheatre, Chicago.

Sept. 24-25—Missouri Valley Regional Foundry Conference, Missouri School of Mines & Metallurgy, Rolla, Mo.

Sept. 28-Oct. 1—Association of Iron & Steel Engineers, annual convention, Sherman Hotel, Chicago.

Oct. 1-2—Central New York Regional Foundry Conference, Drumlins Country Club, Syracuse, N. Y.

Oct. 2-3—Northwest Regional Foundry Conference, Benjamin Franklin Hotel, Seattle.

Oct. 4-10 — International Foundry Congress, organized by Spanish Institute of Iron & Steel, Madrid, Spain.

Oct. 7-9—Gray Iron Founders' Society, annual meeting, Fairmont Hotel, San Francisco.

Oct. 8-9—Michigan Regional Foundry Conference, Pantlind Hotel, Grand Rapids, Mich.

Oct. 10-13 — Conveyor Equipment Manufacturers Association, annual meeting, Grand Hotel, Point Clear, Ala.

Oct. 11-16—American Society for Testing Materials, Pacific area national meeting, Sheraton-Palace Hotel, San Francisco.

Oct. 15-17—Foundry Equipment Manufacturers Association, annual meeting, Greenbrier, White Sulphur Springs, W. Va.

Oct. 16-17—New England Regional Foundry Conference, Massachusetts Institute of Technology, Cambridge, Mass.

Oct. 21—Cast Bronze Bearing Institute, annual meeting, Bedford Springs Hotel, Bedford Springs, Pa.

Oct. 22-23—Ohio Regional Foundry Conference, Deshler-Hilton Hotel, Columbus, Ohio.

Oct. 23-24—Non-Ferrous Founders' Society, annual meeting, Bedford Springs Hotel, Bedford Springs, Pa.

Oct. 29-30—Purdue Metals Casting Conference, Purdue University, Lafayette, Ind.

Nov. 2-6—American Society for Metals, National Metal Exposition & Congress, International Amphitheatre, Chicago.

Nov. 6-7—National Foundry Association, annual meeting, Hotel Roosevelt, New York.

Nov. 9-11—Steel Founders Society of America, Technical & Operating Conference, Carter Hotel, Cleveland.

Nov. 16-20—International Automation Congress & Exposition, New York Trade Show Building, New York.

Dec. 2 — Electric Overhead Crane Institute, annual meeting, Carlton House, Pittsburgh.

Dec. 2-4—Metallurgical Society, American Institute of Mining, Metallurgical, and Petroleum Engineers, Electric Furnace Conference, Hotel Sheraton-Cleveland, Cleveland.

1960

Mar. 7-8—Steel Founders' Society of America, annual meeting, Drake Hotel, Chicago.

Circle 565 on Page 53

Circle 564 on Page 53

Wherever metal glows white hot and perfection is demanded, knowledgeable technicians call for *ANSCO* X-ray films. That's because *ANSCO* films offer a certainty of flaw detection that insures perfection in single welds, castings or production runs.

Try *ANSCO SUPERAY 'A'*. It's a fast, fine grain emulsion, specifically designed to record high contrast images of the smallest defects in either light or heavy materials with gamma or x-rays.

ANSCO SUPERAY 'B' is a medium speed material of extreme contrast and ultra fine grain . . . unsurpassed in radiographic quality.

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Industrial X-ray

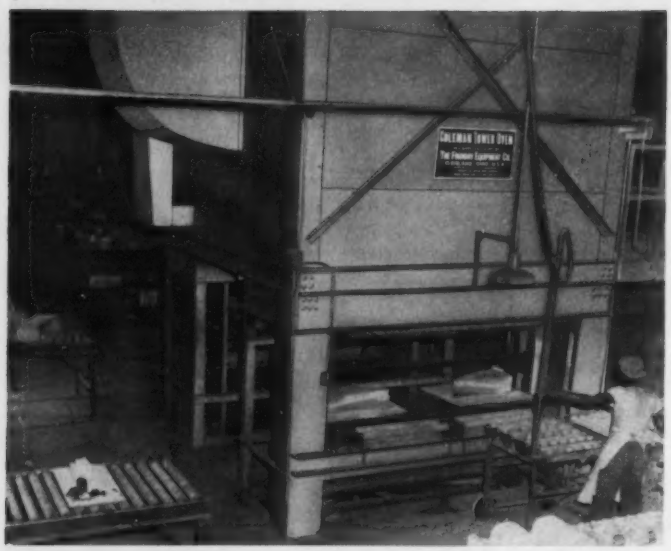
Circle 566 on Page 53

CUT LABOR COSTS

with

Coleman Dielectric Core Oven in leading plumbing fixture foundry. Direct labor alone reduced by 75%, with many other important savings and advantages.

Coleman Conveyor Core Ovens



Coleman Tower® Core Oven. One of two large installations in a major steel foundry. Mechanized handling and baking of cores up to 150 pounds at substantial annual savings.

● Performance records in all types of foundries prove that Coleman Conveyor Core Ovens reduce core department costs by as much as 50%!

Coleman Ovens quickly pay for themselves out of direct savings in labor, materials and reduced casting scrap.

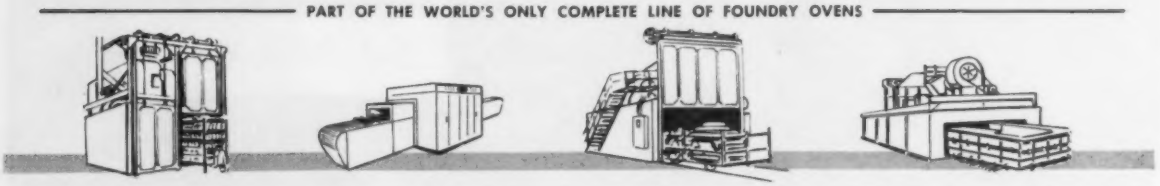
As builders of the world's only complete line of foundry ovens . . . dielectric or recirculating heat . . . we can recommend, without bias, the right oven for your particular needs.

WRITE FOR BULLETIN 54

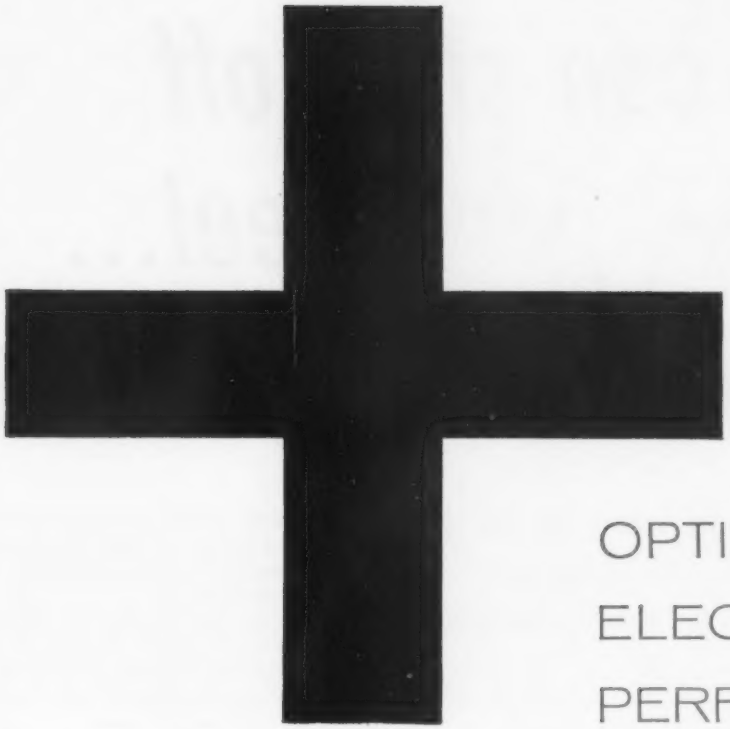
THE FOUNDRY EQUIPMENT COMPANY • 1821 COLUMBUS ROAD, CLEVELAND 13, OHIO

World's Oldest and Largest Foundry Oven Specialists—More than half a century of specialized foundry experience.

PART OF THE WORLD'S ONLY COMPLETE LINE OF FOUNDRY OVENS



TRANSRACK OVENS | DIELECTRIC CORE OVENS | CAR TYPE OVENS | JET ACTION MOLD OVENS



OPTIMUM ELECTRODE PERFORMANCE

. . keeps electric furnace steel costs down.

The flawless machining of GLC electrode sockets and Unitrode™ nipples, to the most exacting tolerances, raises electrode column efficiency to new highs through the sharp reduction in joint resistance. Let comparisons prove this to you!

PRODUCTS ELECTRODE GLC DIVISION YOU CAN TRUST

GREAT LAKES CARBON CORPORATION

18 EAST 48TH STREET, NEW YORK 17, N. Y. OFFICES IN PRINCIPAL CITIES

Circle 568 on Page 53

STEEL FOUNDRIES...

You can snag off more steel per wheel... per man-hour...per

Get proof — with test runs of 44 ALUNDUM* B11 wheels in your plant

Many steel foundries where changes in cleaning room methods and costs have been carefully checked can tell you that Norton wheels of 44 ALUNDUM abrasive, B11 resinoid bonded, pay off in real savings.

Although 44 ALUNDUM abrasive is non-premium priced, its resemblance to ordinary aluminum oxide ends right there. Made by special Norton electric

dollar

furnace process it is much denser and tougher, fast cutting and longer lasting.

The B11 resinoid bond is another important Norton development. Wheels made with it are more uniform in structure, with better balance. As a result they grind cooler and faster. And B11 wheels can be supplied in half-grade increments of hardness, making it easier to choose exactly the right wheels for your jobs.

On your floor stands and swing frames, even down to your smallest portables, 44 ALUNDUM B11 wheels are unequalled for snagging all steel castings. For annealed malleable iron castings, B11 bond wheels with regular ALUNDUM abrasive are best.

Your Norton Man, a trained expert in foundry grinding operations, will be glad to arrange test runs of 44 ALUNDUM B11 wheels in your plant. For this proof of how the time-and-money-saving "Touch of Gold" can be added to all your snagging jobs, see your Norton Distributor, or write to NORTON COMPANY, General Offices, Worcester 6, Mass.

*Trade-Mark Reg. U. S. Pat. Off. and Foreign Countries

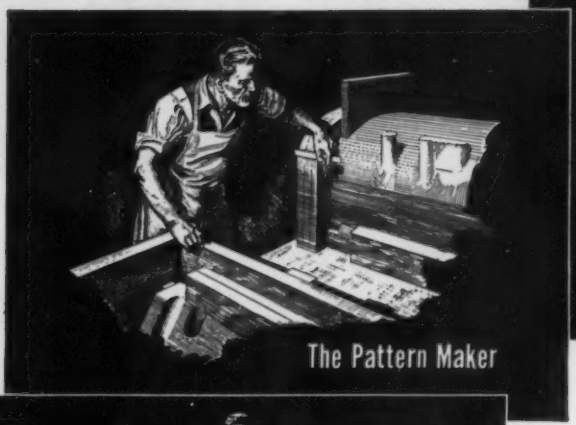
NORTON
ABRASIVES

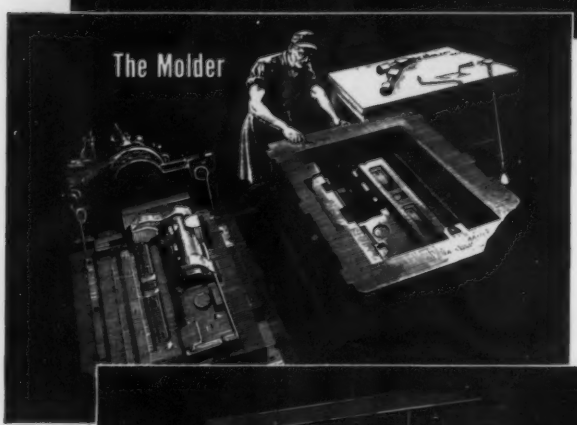
W-1931

Making better products . . . to make your products better

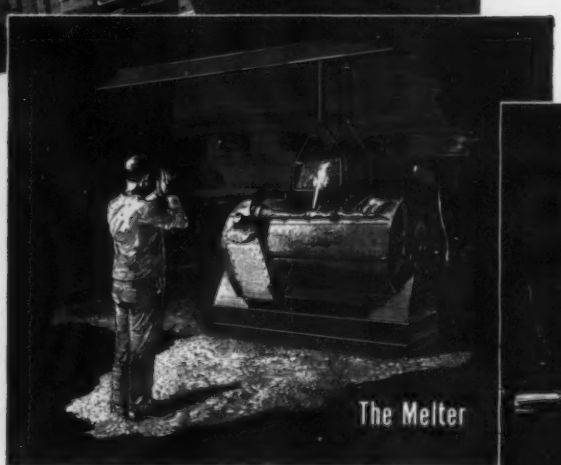
NORTON PRODUCTS: Abrasives • Grinding Wheels • Grinding Machines • Refractories • Electro-Chemicals — **BEHR-MANNING DIVISION:** Coated Abrasives • Sharpening Stones • Pressure-Sensitive Tapes

Circle 569 on Page 53



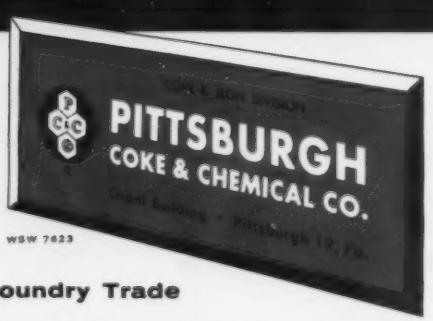


A Salute to the Men of the Great Foundry Industry



Pittsburgh Coke & Chemical Company is proud to pay tribute to the men of the foundry industry. It is equally proud to serve as a basic supplier of quality products for the nation's foundry trade.

Enlarged reproductions (11½x11", suitable for framing) of the etchings illustrated above are available. Any one or a complete set of the etchings will be sent to you without cost, upon request.



Neville Pig Iron and Neville Coke for the Foundry Trade

COKE • PIG IRON • FERROMANGANESE • CEMENT • COAL CHEMICALS • PROTECTIVE COATINGS • PLASTICIZERS • ACTIVATED CARBON

YOU'LL DO A BETTER JOB

with **H. V. ADAMS DESIGNED**

HIGH EFFICIENCY FOUNDRY TOOLS

"UNIVERSAL FREE WHEELING"

FOUNDRY SAND RIDDLE

with the Double Eight Vibration

Because of its convenient size, light weight and good riddling capacity it long has been a favorite in the foundry. It also can be used for mixing core sand or for sifting sand directly into molds.

The mechanism is entirely enclosed protecting it from harmful dust and grit.

The main frame is cast in very strong tough aluminum.

It uses quick change ferruled sieves with 20 in. diameter sifting area. There are no loose wires to harm hands.

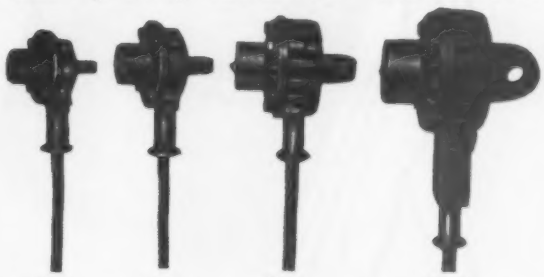
THE "ROTOPLANE" SPEED SIFTER

WILL GIVE YOU

• SPEED • ECONOMY • SAFETY • LONGER LIFE
• GREATER SIFTING CAPACITY

Its sturdy one-piece frame and long shaft add to vibration effectiveness. The sealed-in mechanism assures protection of motor and bearings from exposure to dust and grit. This sealed in protection and "Rotoplane's" free-rotary action vastly increase bearing life. No exposed moving parts endanger the operator. Sieves have 20 inches diameter clear sifting area—are mounted in a smooth steel ferrule with no jagged edges to cause dangerous cuts and scratches.

"RED (Devil) ELECTRIC" VIBRATORS



No 1 No. 2 No. 5 No. 9

These hard hitting Adams designed Vibrators have served the foundries for over 30 years. They are provided with a 6 foot 3 wire authorized cable and 3 wire grounded connector which, when connected with our 3 wire grounded Red Electric Knee Switch, automatically grounds the vibrator protecting the worker from shock. The vibrators have passed the U. S. Government code inspection.

Other Foundry Products:

- No. 11 NOISELESS TYPE VIBRATOR
- A-20 ELECTRIC VIBRATOR
- RED ELECTRIC KNEE SWITCHES
- "ROTO" ADJUSTABLE BIN VIBRATOR
- 2 MIN. UNIVERSAL FINENESS TEST SIFTER.
- UNIVERSAL TRIPOD CARRIER

ORDER ALL SIFTERS AND VIBRATORS WITH GROUND WIRE!!

FOUNDRY SUPPLIES MANUFACTURING CO., NOT INC.

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WASHES · WAS

no matter what the application . . . there is Mold Wash for every foundry need . . . or

SIPAC®

with only the addition of water, produces a bright, gold-colored coating with fine, smooth surfaces, using any foundry sand. It's non-carbonaceous and inert and will not react with any molten metal, including grey iron and steel. Resists flaking and completely protects core surfaces. You get improved casting quality. Sipac is available in 55 gallon drums, ready for mixing and dilution to desired Baume—even to a scale of 32—without settling.

MEXICAN® VV FLAKE ("volatile vehicle")—meets the growing demand for good mold and core wash suited to carbon dioxide mold-core hardening process. Completely compatible with isopropyl alcohol, oleum spirits, kerosene or similar agents, Mexican VV Flake provides extra refractory protection . . . improves skin hardness . . . gives better casting quality. Comes in paste form, suitable for application by spraying or dipping.

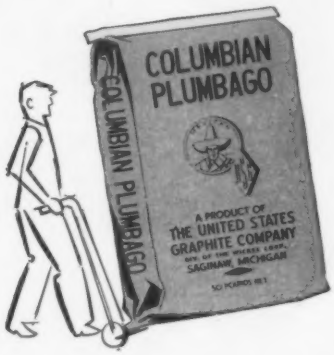
MEXADIP®—refractory core coating containing its own binder, requires only water to prepare it for use. Will not ferment, produces a very uniform, even coating over entire core with practically no sagging, running or dripping. Use it throughout foundry for green or baked cores, ferrous or nonferrous foundry practice.

THE UNITED STATES

GRAPHITAR® CARBON-GRAPHITE • GRAMIX® POWDER METALLURGY • MEXICAN® GRAPHITE PRODUCTS • USG® BRUSHES

HES · WASHES

a United States Graphite Company Core or one may be engineered to your requirement



MEXICAN® COLUMBIAN PLUMBAGO— versatile wet blacking used for loam work, green or dry sand or torch dried molds where soft coat with high resistance is required. Suitable for all types of castings, including those of over 25 tons, high steel mixtures and castings poured at high temperatures.

SLICK RITE® — compounded from a base of high quality flake graphite to produce best slicking qualities, Slick Rite is applied to green sand molds by hand rubbing, tooling or brushing. Excellent casting quality obtained when mixed with water and molasses to produce wet lead for spraying molds and cores.

MEXICAN® 172—high refractory wet blacking with binder. For application to both molds and cores of heavy sectioned castings where best possible finish is required under severe pouring conditions.

No. 866® —is a wet blacking without binder. Provides soft coating with good refractory properties for molds and cores of medium and light sectioned castings. Also makes good blacking for bell end cores in pressure pipe manufacture. Can be applied by spraying, brushing or swabbing at 40-45 Baume.

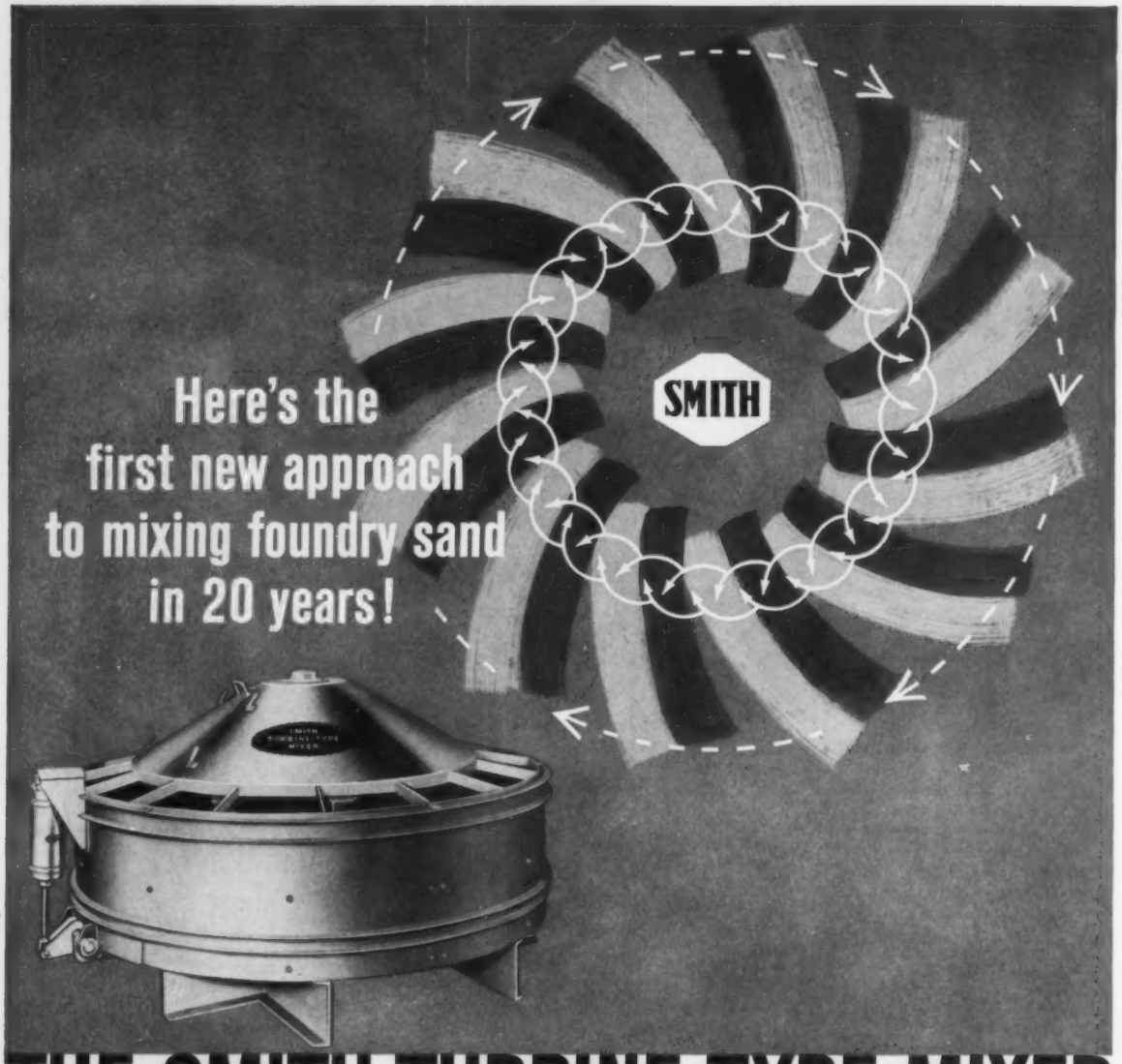
MEXICAN® 700 — is particularly suitable for large molds and dry sand cores of high carbon iron such as cast iron rolls and ingot mold castings poured at intermediate temperatures. Contains no binder.

Write today for engineering bulletin No. 17 giving complete details and application methods of core and mold washes for all ferrous and nonferrous foundries.

GF-244-2

GRAPHITE COMPANY

DIVISION OF THE WICKES CORPORATION, SAGINAW 14, MICHIGAN



THE SMITH TURBINE-TYPE MIXER

Ideal for:

- Coating shell-process sands
- Mixing CO_2-process sands
- Rebonding and reviving heap sands for green-sand molding
- Mixing oil-bonded core sands

A9-4686

Now, for the first time, foundries can buy a modern mixing device that truly blends and mixes *without* the crushing action of a rolling wheel!

The Smith Turbine-type mixer is a high-speed rotary unit that gives an intimate mix, ultra-quick dispersion, and superior coating effect to the inert materials through a unique braiding action.

Besides being at least 3 times faster than wheel-type mills, the Smith Turbine has a remarkable grain-coating ability that chalks up noticeable savings of expensive resins when making shell-molding sands . . . gives greater strength to core sands.

The Smith Turbine is compact and easily installed, requires no base or substructure. Available in sizes from ⅓ to 1½ cu. yd. capacity.

Price? So low you'll kick yourself if you buy any other kind of mixer without investigating the Smith Turbine first! If you're interested, we'll arrange a demonstration in your plant — no obligation, of course.

Manufactured by:
THE T. L. SMITH COMPANY
Milwaukee 1, Wisconsin • Lufkin, Texas

SMITH

Distributed by:
ILLINOIS CLAY PRODUCTS CO.
208 S. LaSalle St. • Chicago, Illinois

Circle 573 on Page 53

Mechanize step by step with Link-Belt equipment

LINK-BELT'S "prescription" for a *more profitable* foundry is easy to take. With this step-by-step plan, you start by mechanizing where you need it most . . . then add equipment piece by piece according to a well-organized plan.

With industry's broadest line of conveyors and preparation equipment—plus know-how developed through 50 years of serving foundries—Link-Belt can match every need of your step-by-step improvement program. And, single components or complete system—you can be sure all are designed to save time, minimize hazards to health and safety, increase productivity with less cost.

Step-by-step mechanization requires long-range planning to achieve a systematic arrangement of equipment. That's where Link-Belt's vast experience pays off. Our specialists will put this experience to work for you . . . will help you set the modernization pace that suits you best. For details, call your nearest Link-Belt office or write for Book 2423.

LINK-BELT

CONVEYORS AND PREPARATION MACHINERY

LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. To Serve Industry There Are Link-Belt Plants and Sales Offices in All Principal Cities. Export Office, New York 7; Australia, Marrickville (Sydney); Brazil, Sao Paulo; Canada, Scarboro (Toronto 13); South Africa, Springs. Representatives Throughout the World. 15,104

FOUNDRY COLOR-SOUND FILM AVAILABLE! Thirty-minute film, "Foundry Flexibility," shows benefits of *complete* mechanization. It will be lent on request for viewing by your group. *WRITE LINK-BELT EXECUTIVE OFFICES TODAY.*

MEMBER FEMA

Circle 574 on Page 53

No cleaning job too tough for Wheelabrator®

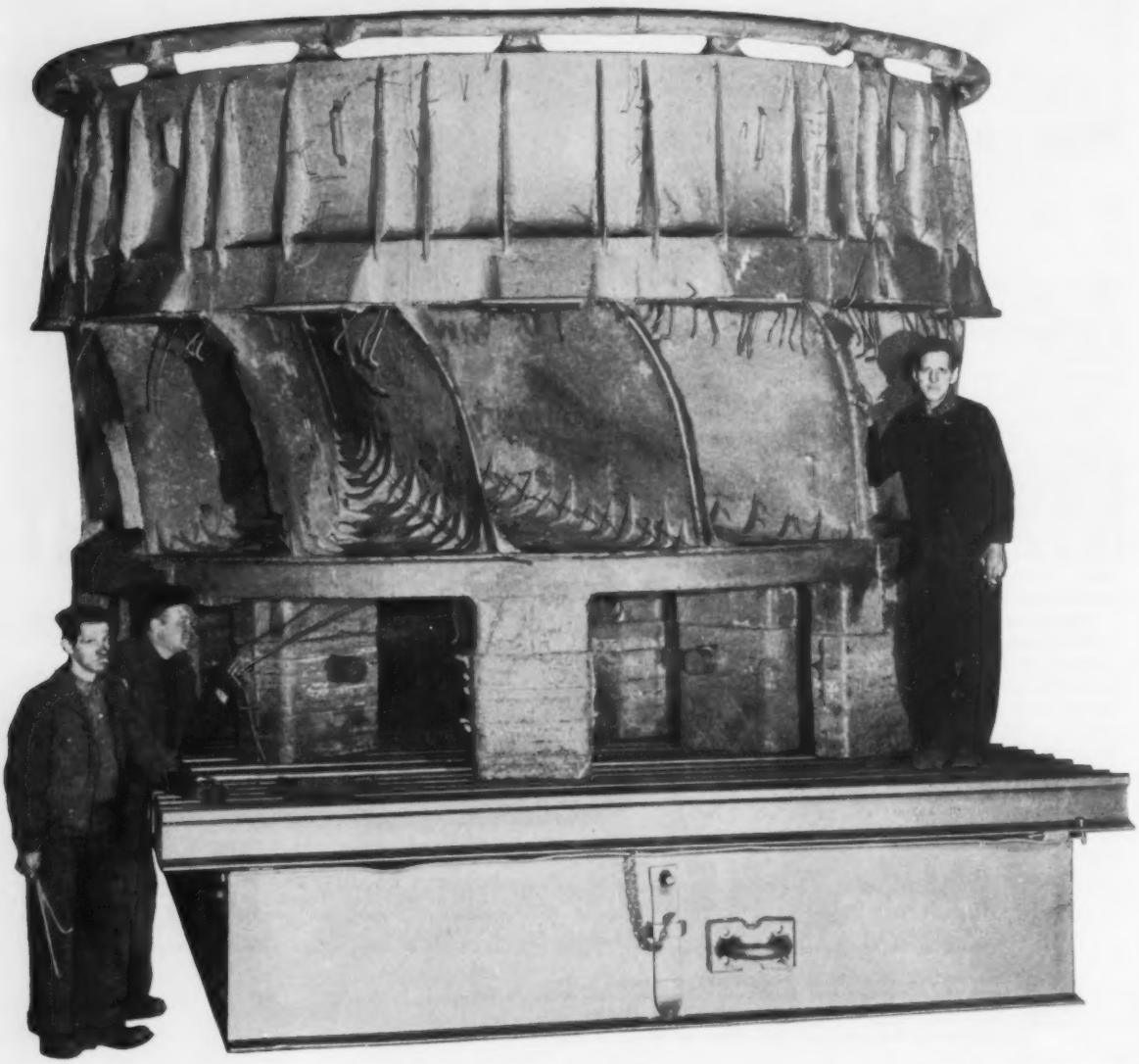
This mammoth casting, for example. Cleaning with manual methods required days of labor. But Wheelabrator airless abrasive blast cleaning reduced the job to minutes besides improving cleaning quality and effecting impressive savings in overall cleaning costs. Wheelabrator has no peer in the number and range of cleaning problems solved nor in the ingenuity with which equipment has been designed and engineered. Here you have at your disposal the richest background of practical cost-saving ideas in the blast cleaning industry.

Write for our 40-page manual of special cleaning problems solved by Wheelabrator cabinets. Ask for Catalog 105-D.

WHEELABRATOR
CORPORATION

505 Byrkit St., Mishawaka, Ind.
Canadian Div. Box 490, Scarborough, Ont.

World's largest manufacturers of airless blast equipment and steel abrasives.



Circle 575 on Page 53

Circle 576 on Page 53→

Lindberg-Designed

furnaces, more than 75 of them, help Ford Motor Company maintain casting production and quality standards

The new Aluminum Castings Plant of Ford Motor Company, Engine and Foundry Division, at Sheffield, Alabama, is a model of modern production efficiency. Contributing to its effective operation is a huge battery of Lindberg-Fisher aluminum holding furnaces, more than 75 of them. Eight large 65,000 lb. capacity reverberatory holding furnaces receive molten aluminum delivered from an adjacent Reynolds Metals plant and hold it at the desired temperature. Six other reverberatory furnaces, each with 20,000 lb. capacity, are used for remelting scrap aluminum from trimmed parts and holding metal at its usable temperatures. Molten metal is then delivered to more than 60 electric resistance holding furnaces in the casting area as needed. This unique installation, developed by Ford engineers in conjunction with Lindberg, is a major factor in maintaining the high quality product and production standards required by Ford.

Lindberg equipment and Lindberg planning can help you find the most effective answer to any problem of applying heat to industry. We cover the field, melting and holding, heat treating, tempering, brazing, enameling furnaces, ceramic kilns, high frequency units, and are in the ideal position to recommend just the type of equipment most suitable for your needs. This can be factory built or field-installed in your own plant, fuel-fired or electric. Consult your local Lindberg Field Representative (see the classified phone book) or get in touch with us direct. Lindberg-Fisher Division, Lindberg Engineering Company, 2453 West Hubbard Street, Chicago 12, Illinois. Los Angeles Plant: 11937 South Regentview Avenue, at Downey, California.

Handsome entrance to new plant of Ford Motor Company, Sheffield, Alabama.

Metal temperatures are positively controlled through Lindberg Control Panel.

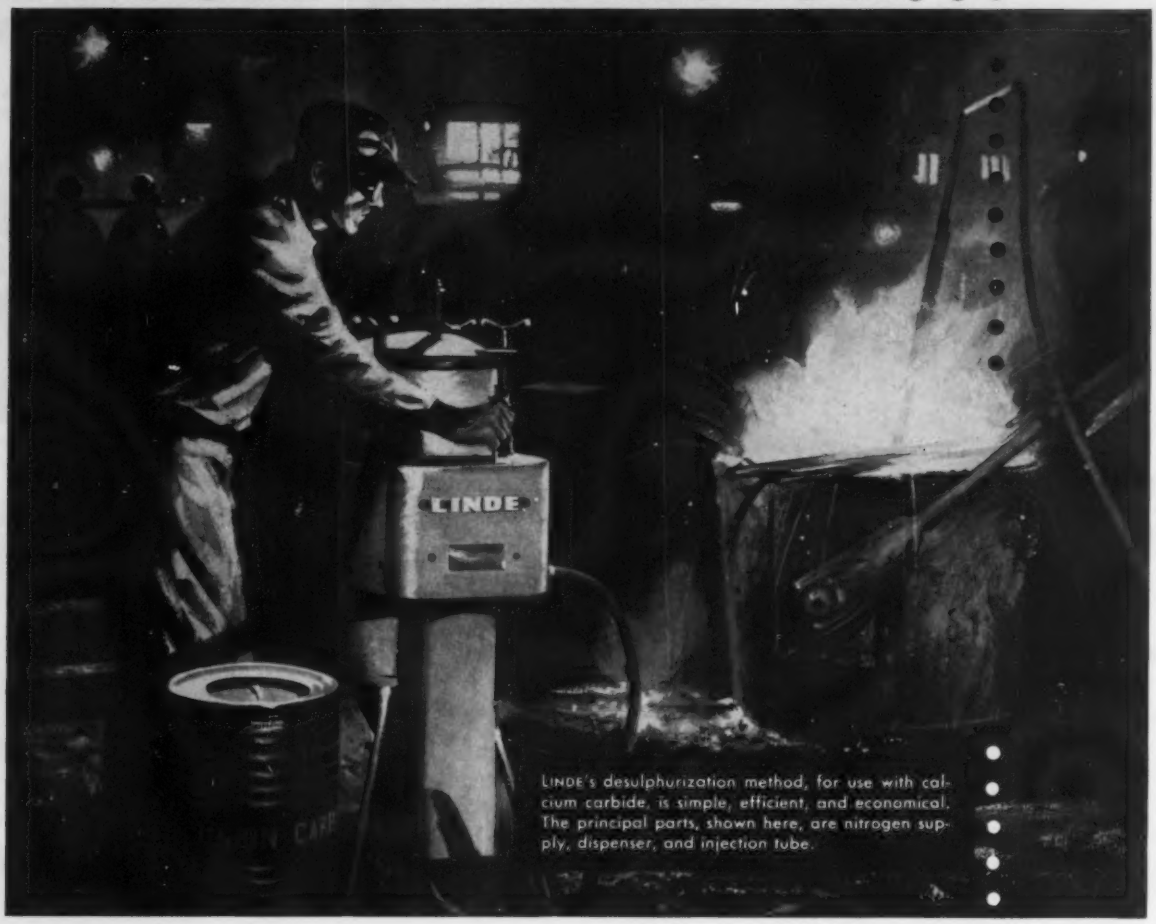
Some furnaces are arranged for hand ladling and others are equipped with Lindberg Auto-ladle.

Molten aluminum is delivered direct to reverberatory holding furnaces.

The molten metal is held in these 14 huge furnaces for distribution to the casting areas.

LINDBERG heat for industry

DESULPHURIZATION...



LINDE's desulphurization method, for use with calcium carbide, is simple, efficient, and economical. The principal parts, shown here, are nitrogen supply, dispenser, and injection tube.

You get uniform results with Metallurgical Carbide from LINDE

In the foundry, you can produce high grade iron only by making sure you use metal with a low sulphur content. As a desulphurizing agent, metallurgical calcium carbide assures *uniformity* in the metal you produce. You know in advance that by adding a certain amount of carbide you remove a certain percentage of sulphur. Because metal specifications can be met efficiently and economically with carbide, you eliminate any need for wasteful "trial and error" methods.

Linde's method of mixing UNION calcium carbide and molten iron is simple and sure. A stream of fine mesh carbide and nitrogen under pressure is forced from a dispenser through a hose. The graphite injection tube is immersed deep in the hot metal. The carbide blends evenly and thoroughly with the iron. Desulphurization with UNION calcium carbide creates no fumes, does not attack refractories. The LINDE equipment—nitrogen supply, dispenser, and injection tube—is easy to operate and maintain.

If you would like more information about LINDE's method of desulphurization, using calcium carbide, just call or write your nearest LINDE office. LINDE COMPANY, Division of Union Carbide Corporation, 30 East 42nd Street, New York 17, N. Y. Offices in other principal cities. In Canada: Linde Company, Division of Union Carbide Canada Limited.

Linde
TRADE-MARK

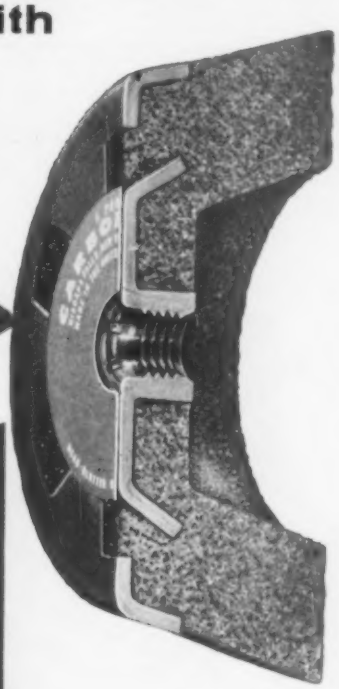
UNION CARBIDE

The terms "Linde," "Union" and "Union Carbide" are registered trade-marks of Union Carbide Corporation.

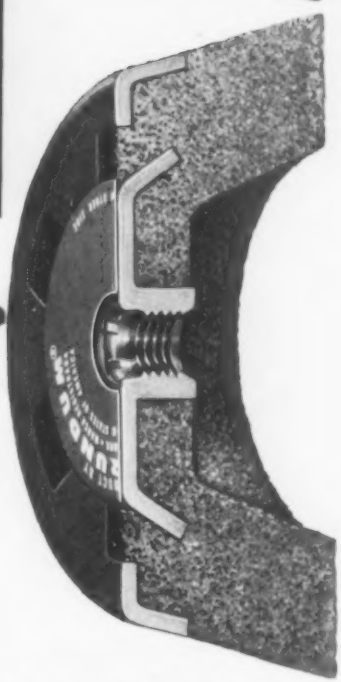
Circle 577 on Page 53

new development for rough grinding applications... the cup wheel with

"built-in guard"



- extra strong
- break-resistant
- positive mounting
- no work interference



Here's a new, portable cup wheel by CARBORUNDUM that offers outstanding safety and performance features for all rough grinding applications in steel mills, foundries, welding shops, etc. The "built-in" guard consists of a one-piece combination steel back and prong-type bushing molded into the fast-cutting resinoid bond. It is easy to mount, eliminates heavy conventional safety guards, and does not interfere with the work piece.

CARBORUNDUM
REGISTERED TRADE MARK

Send for more information **TODAY** →

THE CARBORUNDUM COMPANY
Bonded Abrasives Division, Dept. 81-92
Niagara Falls, New York

Please send me Form A-1523 which tells me about Cup Wheels with "Built-In" Guard.

Name _____ Title _____

Company _____

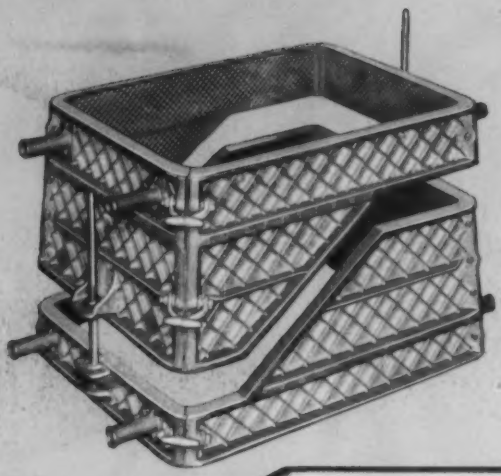
Address _____

City _____ Zone _____ State _____

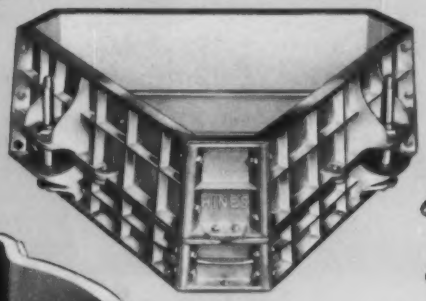
81-92

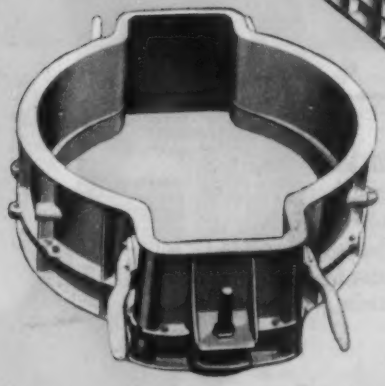
Circle 578 on Page 53

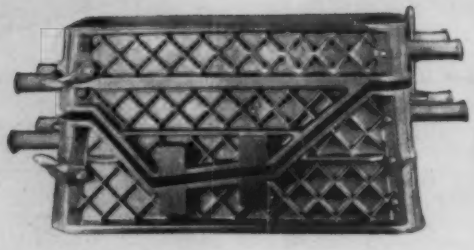
HINES SPECIAL FLASKS



• Shown here are but a few of the many special flasks designed and fabricated by HINES to do difficult molding jobs more efficiently. In many cases, HINES has been able to design flasks for making castings previously considered impractical, if not impossible to produce. Many of these special flasks incorporate the familiar HINES "POP-OFF" corner release mechanism, to further speed up production, increase accuracy of the mold and prolong flask life.







It's entirely possible that a HINES "special" may be the answer to that difficult molding problem now confronting you. Our engineering department will gladly submit recommendations. A phone call, wire or letter will put them on the job at once.

THE HINES FLASK CO.

3431 WEST 140th STREET • CLEVELAND 11, OHIO

ORchard 1-2806

HINES FLASKS

Circle 579 on Page 53

Late News

NEW HIGH: Foundries have benefited from the forces chiefly responsible for pushing industrial production to a new high in May. The Federal Reserve Board index for the month was 152, up 2 points from April and 5 points ahead of the prerecession peak. Durable goods have led the upswing, which has pushed output of factories and mines 20 per cent above the recession low, including a 10 per cent gain since January. Automobiles, farm implements, and construction equipment —large users of castings—have been among the most active industries.

SECOND HALF: Second half of 1959 will see a further rise in sales and earnings of the metalworking industries. This is the prediction of metalworking managers in a recent study by *Steel* magazine. Upturns compared with the first half also are expected in employment, costs, selling prices, and plant capacity. The average increase in sales is placed at 5 per cent, with a boost of nearly 11 per cent seen for the entire year compared with 1958. Major gains for the year as a whole are predicted for primary metals, machinery (except electrical), and transportation equipment.

SCRAP PRICES: Divergent trends continue to be shown by prices of steelmaking and ironmaking grades of scrap. As the steel strike situation headed for a showdown this week, heavy melting steel was selling at about the level of a year ago despite a nearly 50 per cent higher mill operating rate. Cupola cast, machinery cast, and malleable scrap grades,

Foundry Statistics

Iron and Steel Scrap Consumption

(Gross tons*)

	All Scrap Total	By Types of Furnace — Cupola Total	Air Total	Electric Total
1957	65,688,502	9,220,405	1,026,951	8,876,400
1958				
Feb.	3,491,441	511,394	64,971	466,657
2 mo. ..	7,563,512	1,316,048	141,960	1,032,882
Mar.	3,718,132	624,165	64,866	524,035
Apr.	3,429,121	599,427	61,839	631,220
May	3,862,491	596,253	59,060	553,756
June	4,409,006	615,271	62,703	605,733
July	3,716,739	543,726	47,203	513,394
Aug.	4,203,034	580,844	66,877	592,727
Sept.	4,472,219	680,660	71,198	637,400
Oct.	5,091,207	707,378	90,707	757,722
Nov.	4,803,615	700,704	74,382	691,078
Dec.	4,973,670	761,494	80,593	712,779
Total ...	50,242,746	7,725,970	821,388	7,152,726
1959				
Jan.	5,375,042	783,045	86,519	767,289
Feb.	5,657,873	791,137	88,326	801,692
2 mo. ..	11,050,915	1,574,182	194,845	1,568,981

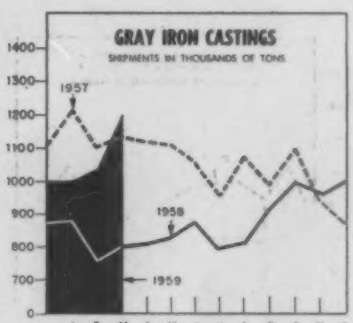
Index of Foundry Equipment Orders

Foundry Trades Only
(Net Orders Closed, New Equipment)

	1958	1959
Jan.	57.9	127.4
Feb.	57.6	237.1
Mar.	85.9	166.6
Apr.	88.7	154.2
May	136.1	....
June	87.7	....
July	77.9	....
Aug.	74.1	....
Sept.	94.5	....
Oct.	116.9	....
Nov.	83.3	....
Dec.	137.0	....

Note: Base period 1947-49 taken as 100 per cent monthly average.

Source: Foundry Equipment Manufacturers Association.



GRAY IRON CASTINGS—SHIPMENTS

(Net tons[1])

	All Castings — Total	All Castings — For Sale	Miscellaneous Castings — Total	Miscellaneous Castings — For Sale	Nodular Iron Castings Total	Heavy Steel Ingot Molds Total	Chilled Railroad Car Wheels Total	Pressure Pipe & Fittings Total[2]	Soil Pipe & Fittings Total[2]	Unfilled Orders[2]
1957	12,664,504	6,876,497	7,786,229	3,310,915	.....	2,409,290	350,332	1,351,345	758,308	.....
1958										
Mar.	795,568	446,822	499,751	215,916	9,485	125,887	24,777	87,716	57,437	589,912
3 mo. ..	2,417,129	1,272,928	1,583 471	648,647	30,530	377,165	74,247	234,185	148,061	.....
Apr.	806,720	457,498	483,999	210 344	8,015	121,489	25,401	112.292	63,539	582,446
May	820,054	472,192	469,026	203,025	9,511	134.312	23,496	123,017	70,201	570,293
June	867,948	541,904	503,252	245,651	8,951	135,477	22,928	129,671	76,620	572,706
July	791,560	465,650	430,882	185 275	8,696	157,478	19,928	110,790	72,481	580,155
Aug.	802 473	513,862	410,876	205,821	8,323	165,006	18,537	129,157	78,897	614,199
Sept.	916,704	537,717	518,185	227,414	7,902	175,323	20,783	125,693	76,720	644,834
Oct.	992,730	586,614	551,380	253.062	10,857	207,500	22,970	129,375	81,505	619,667
Nov.	958,306	505,290	575,586	231,669	11,731	201.704	18,801	98,326	63,889	602,375
Dec.	997,608	509.499	628,720	246,289	13,072	208,942	18,021	85,179	56.746	606,096
Total ...	10,371,232	5,863,154	6,155,377	2,627,197	117,588	1,884,396	265,134	1,277,685	788,479	.....
1959										
Jan.	1,001,771	517,390	625,604	250,161	12,061	214,985	27,650	75,571	55,656	687,245
Feb.	1,036,655	538,514	642,882	252,115	12,619	230.706	31,035	76,147	55,885	767,360
Mar.	1,205.572	666,034	701,527	286,692	13,881	270,293	35,820	108.131	89.801	846,937
3 mo. ..	3,244,008	1,721,938	1,970,013	788,968	38,561	715,984	94,505	259,849	203,742	.....

*Source: U. S. Dept of Interior Bureau of Mines. [2]Source: Bureau of Census. [3]For sale only. [4]All cast iron pipe is shipped for sale.

Late News

on the other hand, were bringing $5 to $8 a ton more at most centers than at the end of last June. Pig iron prices have been unchanged the last 12 months.

ZOOMIN' ALUMINUM: Still breaking records, primary aluminum production reached a new monthly record of 163,857 tons during May. It brought total 1959 production through that month to 775,076 tons. The latter figure compares with 647,236 tons for the same 1958 period. The new record may not last long, for Reynolds Metals Co. announced during June that its annual production will be raised 42,000 tons, to 601,000 tons, or 100 per cent of capacity.

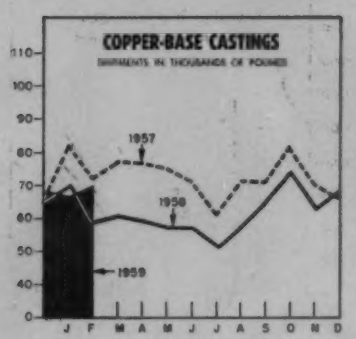
MARKETING: Non-Ferrous Founders' Society is launching a marketing program designed to assist foundry management in the solution of sales problems. In announcing the program the society has released a new alloy specification and property chart and the first two of a series of case histories illustrating particularly successful applications of nonferrous castings. Work of the society's marketing committee is being integrated closely with that of the cost committee and technical committee.

MORE FREIGHT CARS: Railroads continue to order freight cars in good volume. May orders totaled 5253 cars, against 3736 for April and 1370 a year ago. June 1 backlogs of 36,869 compare with 30,386 on order on June 1, 1958.

G. DIXON SHRUM DIES: G. Dixon Shrum, 63, secretary-treasurer, Foundry Facings Manufacturers Association, Pittsburgh, died unexpectedly June 12. A graduate of the University of Pittsburgh, he was a well known attorney and former president of the Allegheny Bar Association.

PERSONALS: Edgar I. Gotthold, formerly with Budd-Stanley Co., Long Island City, N. Y., has joined Gorham Mfg. Co., Providence, R. I., as foundry superintendent . . . Arthur H. Vaughan, chief engineer, Electric Furnace Co., Salem, Ohio, has been awarded the Trinks Industrial Heating Award . . . Donald H. Ambrose, assistant foundry superintendent, Rosedale Foundry & Machine Co., Pittsburgh, has been

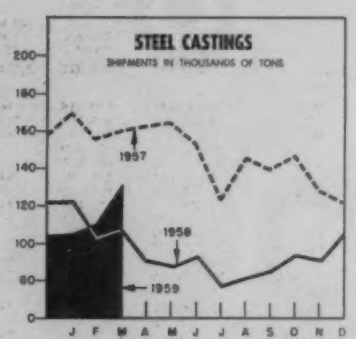
Foundry Statistics



COPPER-BASE CASTINGS

(Shipments of castings—1000 pounds[1])

	Shipments			
	Total	Sand	Perm. Mold	Unfilled Orders[2]
1957	874,627	789,014	44,789	.....
1958				
Feb.	58,356	52,579	3,202	27,243
2 mo.	128,063	115,873	6,529	.....
Mar.	60,157	54,007	3,395	25,434
Apr.	59,311	53,271	3,385	25,621
May	57,506	51,634	3,077	22,867
June	57,124	51,967	3,001	21,578
July	51,124	46,636	2,351	20,518
Aug.	57,790	52,981	2,425	24,851
Sept.	64,447	58,435	2,888	25,655
Oct.	74,012	67,564	3,239	26,726
Nov.	62,746	57,386	2,604	24,928
Dec.	67,905	61,119	3,535	25,078
Total	740,158	670,873	36,429	.....
1959				
Jan.	68,874	59,556	3,372	25,344
Feb.	69,589	62,593	3,567	25,377
2 mo.	136,463	122,449	6,829	.....



STEEL CASTINGS—SHIPMENTS

(Net tons[1])

	All Castings			Carbon			Alloy			
	Total	For Sale	Railway Specialties	Total	For Sale	Railway Specialties	Total	For Sale	Railway Specialties	Unfilled Orders[2]
1957	1,766,191	1,359,747	349,059	1,328,475	1,019,090	324,951	437,713	340,657	24,108	.....
1958										
Mar.	106,233	82,195	16,180	77,564	60,208	15,240	28,669	21,987	940	252,840
3 mo.	330,252	256,620	55,372	239,372	185,192	51,628	90,880	71,428	3,744	.....
Apr.	91,464	69,121	11,956	65,639	48,998	11,107	25,825	20,123	849	229,503
May	87,002	66,066	10,416	61,105	45,967	9,463	25,897	20,119	953	211,346
June	92,861	71,624	14,185	67,227	50,919	12,987	25,634	20,706	1,198	190,779
July	68,802	48,618	5,400	46,856	32,161	4,656	21,944	16,457	744	200,272
Aug.	80,886	59,816	8,021	57,539	42,069	7,090	23,347	17,447	931	196,300
Sept.	85,277	64,596	9,205	60,392	44,890	7,905	24,885	19,696	1,300	196,482
Oct.	95,389	73,367	12,254	67,906	51,065	10,980	27,483	22,302	1,274	184,925
Nov.	85,267	65,788	9,648	59,793	45,808	8,501	25,474	19,980	1,147	193,960
Dec.	103,800	81,360	13,187	76,015	59,171	11,934	27,785	22,189	1,253	214,352
Total	1,211,000	856,986	149,644	801,846	606,240	138,251	319,254	250,716	10,393	.....
1959										
Jan.	105,392	82,683	14,408	76,242	59,027	12,948	29,150	23,656	1,460	232,646
Feb.	110,280	86,013	14,686	79,365	61,261	13,316	30,645	24,752	1,370	245,096
Mar.	131,317	103,848	20,086	93,309	75,968	18,410	35,008	27,880	1,676	270,682
3 mo.	346,989	272,544	49,180	248,916	196,256	44,674	94,803	76,288	4,506	.....

[1]Source: Bureau of Census. [2]For sale only.

appointed superintendent . . . L. A. Dunn, formerly manager of the Erie, Pa., foundries, General Electric Co., has been named general manager, Buck Iron Co. Inc., Buck, Pa. . . . John M. Dugan, recently works manager and chief metallurgist, Lima, Ohio, plant, Ohio Steel Foundry Co., has been elected vice president of operations at Lima . . . Lane M. Currie has been appointed executive vice president, H. C. Macaulay Foundry Co., Berkeley, Calif., succeeding the late Earl Paltenghi. Victor Henderson has been named foundry superintendent, and Allan Henderson has been added to the Macaulay sales staff.

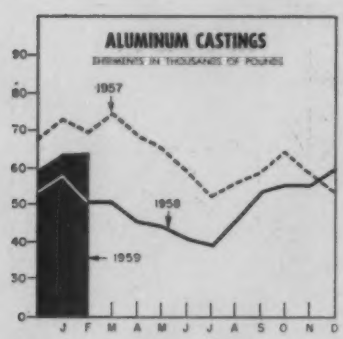
ASTM ELECTS: Frank L. LaQue, vice president and manager, Development and Research Div., International Nickel Co., New York, was elected president of the American Society for Testing Materials at its annual meeting in Atlantic City, N. J., June 21-26. Miles N. Clair, president, Thompson & Lichtner Co., Brookline, Mass., was elected junior vice president, and A. Allan Bates, vice president of research and development, Portland Cement Association, becomes senior vice president.

Herbert W. Stuart, director of quality control, United States Pipe & Foundry Co., Burlington, N. J., was one of 13 recipients of the ASTM Award of Merit at the meeting.

EQUIPMENT NOTES: Orders placed for material handling equipment during April had an index of 147.3 (1954=100), practically unchanged from April and the highest point since May, 1957, the Material Handling Institute reports.

May orders for industrial furnaces of $4,174,000 were down sharply from the April total of more than $13 million, according to the Industrial Heating Equipment Association. The latter figure exceeded the first three months of 1959 combined, however, and a drop was to be expected. Orders for the first five months of 1959 of nearly $30 million were 112 per cent ahead of the 1958 period.

Foundry equipment orders continue fairly steady and active. The Foundry Equipment Manufacturers Association index for April was 154.2, or 17 points better than any 1958 month. It compares with 166.6 in March and 85.9 a year ago.



PRODUCTION WORKERS

Estimated Number

	March 1959	Feb. 1959	March 1958
Ferrous	189,800	184,400	169,600
Nonferrous	52,300	51,600	46,000

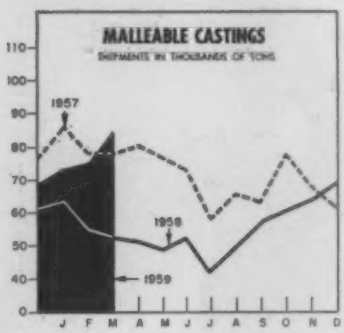
Average Weekly Earnings

Gray Iron	$95.20	$93.38	$79.39
Malleable Iron	95.04	93.77	83.17
Steel	103.96	101.81	89.28
Nonferrous	97.51	97.44	89.71

Average Weekly Hours

Gray Iron	40.0	39.4	35.6
Malleable Iron	40.1	39.9	36.8
Steel	41.1	40.4	37.2
Nonferrous	40.8	40.6	38.5

Source: Bureau of Labor Statistics.



ALUMINUM CASTINGS

(Shipments of castings—1000 pounds[1])

	Shipments Total	Sand	Perm. Mold	Die	Unfilled Orders[2]
1957	751,818	143,991	232,326	375,556	.....
1958					
Feb.	50,695	9,601	15,456	25,279	75,647
2 mo.	103,540	20,325	33,538	54,216	.....
Mar.	50,547	9,311	15,255	25,918	63,606
Apr.	44,948	9,531	13,369	21,956	60,317
May	44,093	9,312	13,648	21,091	59,666
June	40,701	8,644	13,679	18,292	63,670
July	38,818	8,658	12,342	17,714	68,618
Aug.	45,034	9,034	14,426	21,506	71,135
Sept.	52,798	10,261	16,241	26,254	72,819
Oct.	55,699	10,932	17,189	27,511	73,474
Nov.	55,793	10,539	16,942	28,264	76,370
Dec.	59,487	10,874	15,970	29,579	78,732
Total	596,456	117,421	195,599	292,300	.....
1959					
Jan.	62,927	10,907	20,606	31,349	83,314
Feb.	62,846	10,627	21,127	31,021	87,767
2 mo.	125,773	21,534	41,733	62,370	.....

[1]Source: Bureau of the Census. [2]For sale only.

MALLEABLE IRON CASTINGS

(Shipments of castings—net tons[1])

	Shipments Total	Shipments For Sale	Standard Total	Standard For Sale	Pearlitic Total	Pearlitic For Sale	Unfilled Orders[2]
1957	862,976	520,118	713,539	431,662	149,437	88,456	.....
1958							
Mar.	51,708	29,624	43,368	24,333	8,340	5,291	54,330
3 mo.	169,092	95,550	140,227	78,230	28,865	17,320	.....
Apr.	50,695	29,358	41,794	23,605	8,901	5,753	47,664
May	48,306	26,656	40,092	21,710	8,214	4,946	46,603
June	51,882	31,077	42,910	25,679	8,972	5,398	48,260
July	41,865	24,479	33,557	20,023	8,008	4,456	58,340
Aug.	49,252	29,414	41,734	24,696	7,518	4,718	55,145
Sept.	56,536	31,999	45,945	26,370	10,591	5,629	58,405
Oct.	60,981	40,014	50,151	31,992	10,800	8,022	63,425
Nov.	63,356	35,221	50,063	28,409	13,293	6,812	66,725
Dec.	68,385	40,041	53,797	32,883	14,588	7,158	66,725
Total	660,640	382,839	540,660	313,597	120,050	70,242	.....
1959							
Jan.	73,186	43,667	56,700	35,139	16,486	8,528	77,322
Feb.	74,760	42,093	57,573	31,976	17,187	10,117	90,291
Mar.	84,335	49,690	57,439	40,515	16,896	9,175	95,822
3 mo.	232,281	135,450	181,712	107,630	50,569	27,820	.....

Prices of Foundry Metals and Coke

(As of June 26, 1959)

FOUNDRY COKE

(Per net ton, f.o.b. ovens)

BEEHIVE

Connellsville	$18.00-18.50

OVEN

Birmingham	$30.35
Buffalo	32.00
Detroit	32.00
Erie, Pa.	32.00
Indianapolis	31.25
Kearny, N. J.	31.25
Milwaukee	32.00
Neville Island (Pittsburgh)	30.75
New England, deld.	33.53
New Haven, Conn.	31.00
Painesville, O.	32.00
Philadelphia	31.00
St. Louis	33.00
St. Paul	31.25
Swedeland, Pa.	31.00
Terre Haute, Ind.	31.25

PIG IRON

(Per gross ton, f.o.b. furnace)

	No. 2 Foundry	Malleable
Birdsboro, Pa.	$68.50	$69.00
Birmingham	62.50	66.50
Buffalo	66.50	67.00
Chester, Pa.	68.50	69.00
Chicago	66.50	66.50
Cleveland	66.50	66.50
Duluth	66.50	66.50
Erie, Pa.	66.50	66.50
Everett, Mass.	68.00	68.50
Fontana, Calif.	75.50	....
Geneva, Utah	66.50	....
Granite City, Ill.	68.40	68.90
Neville Island (Pittsburgh)	66.50	66.50
Swedeland, Pa.	68.50	69.00
Toledo, O.	66.50	66.50
Troy, N. Y.	68.50	69.00
Youngstown, O.	....	66.50

NONFERROUS INGOT

(Cents per pound, carlots)

BRASS AND BRONZE: Red brass, No. 115, 30.25; tin bronze, No. 225, 41.25; No. 245, 35.00; high-leaded tin bronze, No. 305, 34.50; No. 1 yellow, No. 405, 24.75; manganese bronze, No. 421, 27.75.

ALUMINUM: 99 per cent plus primary ingots 26.30. Secondary No. 12 alloy, 23.75-24.00. Deoxidizing grades: No. 1, 24.50; No. 4, 21.50.

MAGNESIUM: 99.8 per cent notched ingots 36.00, f.o.b. Velasco, Tex. (10,000 lb or more).

COPPER: Electrolytic 31.50, delivered Connecticut valley.

ZINC: High grade 12.00, delivered. Die casting alloy No. 3, 14.00; No. 2, 14.50, delivered.

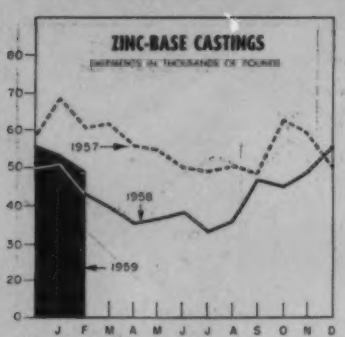
IRON AND STEEL SCRAP

(Consumer prices per gross ton delivered, except as otherwise noted)

	No. 1 Heavy Melting Steel	No. 1 Cupola Cast	Heavy Breakable Cast	Clean Auto Cast	Machinery Cast	Malleable	Short Steel Rails
Birmingham	$32.50-33.00	$53.00-54.00	.....	.....	.....	.....	.....
Boston*	**26.00-27.00	**33.00	.....	.....	**34.00	.....	.....
Buffalo	33.00-34.00	**42.00-43.00	.....	.....	**46.00-47.00	.....	51.00-52.00
Chicago	35.00-36.00	52.00-53.00	.....	56.00-59.00	58.00-59.00	59.00-60.00	55.00-57.00
Cincinnati*	**33.50-34.50	**45.00-46.00	**41.00-42.00	.....	**51.00-52.00	.....	**55.00-56.00
Cleveland	36.00-37.00	47.00-48.00	38.00-39.00	50.00-51.00	50.00-51.00	65.00-66.00	57.00-59.00
Detroit*	**29.00-30.00	**45.00-46.00	**36.00-37.00	**50.00-51.00	.....	.....	.....
Los Angeles	38.00	**47.00	.....	.....	.....	.....	.....
New York*	28.00-29.00	36.00-37.00	34.00-35.00	.....	.....	.....	.....
Philadelphia	38.00	41.00	42.00-43.00	.....	49.00-50.00	67.00-68.00	.....
Pittsburgh	36.00-37.00	45.00-46.00	.....	46.00-47.00	52.00-53.00	.....	46.00-48.00
St. Louis*	33.00	50.00	40.00	54.00	.....	.....	49.00
San Francisco	36.00	44.00	28.00	40.00	40.00	.....	.....
Seattle	35.00	34.00	28.00	.....	.....	.....	.....

*Brokers' buying prices. **F.o.b. shipping point

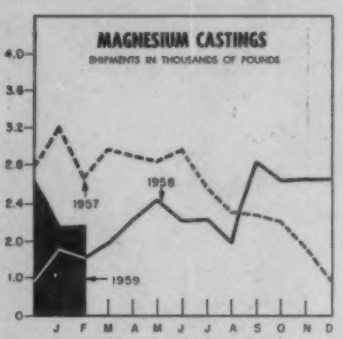
Foundry Statistics



PIG IRON

PRODUCTION**—Net Tons

	Foundry	Malleable & Silvery	Low & Int. Low Phos. & Bessemer
1957	2,275,759	3,997,335	7,452,203
1958			
Apr.	136,180	173,139	424,954
4 mo.	499,564	827,155	1,549,161
May	127,438	165,045	396,009
June	121,869	167,192	342,617
July	123,075	156,582	402,850
Aug.	141,185	145,216	396 511
Sept.	133,556	234,752	416,026
Oct.	146,386	257,111	575,806
Nov.	175,210	257,131	489,095
Dec.	154,007	272,375	429,299
Total[1]	1,622,320	2,448,917	4,954,854
1959			
Jan.	190,392	253,105	479,019
Feb.	121,716	258,250	312,284
Mar.	173,881	341,215	412,533
April	159,950	296,384	427,227
4 mo.	645,939	1,159,406	1,429,902



ZINC-BASE CASTINGS

(Shipments of castings—1000 pounds*)

	Shipments—Total	Shipments—For Sale	Unfilled Orders[1]
1957	660,775	431,560	.....
1958			
Feb.	42,687	27,482	50,676
2 mo.	93,255	57,850	.....
Mar.	39,719	26,782	45,366
Apr.	35,796	23,830	27,634
May	36,447	24 588	33,438
June	38,132	25,993	34,888
July	32,765	22,843	41,534
Aug.	35,860	26,971	45,066
Sept.	47,127	33,520	50,762
Oct.	45,045	36,103	58,154
Nov.	48,431	34,054	57,864
Dec.	55,600	39 768	56,756
Total	508,177	352,302	.....
1959			
Jan.	53,347	37,887	61,192
Feb.	48,779	34,147	61,163
2 mo.	102,126	72,034	.....

CONSUMPTION*—Gross Tons

	Cupola	Air	Electric
1957	4,160,891	218,178	246,851
1958			
Jan.	366,794	16,102	14,426
Feb.	260,940	14,014	7,740
2 mo.	567,734	30,116	22,166
Mar.	270,214	13,472	8,753
Apr.	262,007	13 975	9,585
May	256,204	12,001	11,764
June	262,883	12,096	15,549
July	239,140	10.550	12,140
Aug.	247,428	13,196	32,300
Sept.	300,173	14,994	27,759
Oct.	300,115	17,393	34,273
Nov.	287,013	14,862	31,397
Dec.	321,741	16,610	25,450
Total	3,314,653	169,267	231,145
1959			
Jan.	321,302	17,113	36,783
Feb.	324,876	17,960	37 414
2 mo.	646,178	35,073	74,197

MAGNESIUM CASTINGS

(Shipments of castings—1000 pounds*)

	Shipments—Total	Shipments—For Sale	Unfilled Orders[2]
1957	30,322	28,452	.....
1958			
Feb.	1,803	1,730	5,589
2 mo.	3,684	3,486	.....
Mar.	1,975	1,860	5,555
Apr.	2,215	2,141	5,555
May	2,422	2,196	5,200
June	2,205	1,996	5,515
July	2,200	2,063	6,706
Aug.	1,869	1,808	6,086
Sept.	2,804	2,581	6,083
Oct.	2,627	2,479	5,463
Nov.	2,615	2,523	4,063
Dec.	2,612	2,384	5,115
Total	27,225	25,517	.....
1959			
Jan.	2,151	2,044	5,001
Feb.	2,162	2,006	5,030
2 mo.	4,313	4,050	.....

*Source: U. S. Dept. of Interior, Bureau of Mines. **Source: American Iron & Steel Institute. [1]Source: Bureau of the Census. [2]For sale only. [3]Monthly figures do not add up to totals shown because of unreported monthly revisions.

For Cleaner Surfaces, Better Shakeout, Try

WHITEHEAD'S NEW HYGEIA LYQUAFLOUR

Our new plant at Irwin, Pa., is producing the improved DUSTLESS DOUBLE STRENGTH HYGEIA LYQUAFLOUR. The compound of a special hydrocarbon and woodflour improves castings and mold conditions for all types of metal. Highly recommended for the advantages listed below:

- One sand additive controls both peel and expansion
- Good shakeout saves sand
- Imparts highest flowability to sand mixture to give pattern true finish
- 2% initial treatment of sand and as little as ¼ of 1% to reactivate does the job
- Replaces any carbon or hydrocarbon materials now used
- Eliminates dust at the muller
- Castings peel excellently which reduces cleaning room time
- Reduces penetration and burn-on
- Overcomes sand expansion defects, maintains good compression strength
- Improves molding, "feel", and "moldability"
- No rigid control required
- Permits hard ramming
- Less ramming required, more molds per hour
- Less temper water needed

Whitehead Brothers COMPANY

Established 1841

NEW YORK OFFICE
324 West 23rd St., New York 11, N. Y.

NEW ENGLAND OFFICE
75 Westminster St., Providence 1, R. I.

Manufacturers of

LYQUAGRIP
Ready-to-use core paste

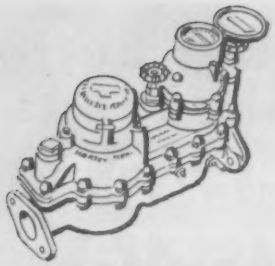
DUO RESIN
Binder for baking with controlled oven temperatures

JOINT SEAL
Plastic compound for perfect sealing

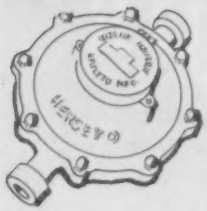
LYQUAFACE
The liquid sand grain coating

DOB-IT
Ready-to-use core mudding compound

Circle 580 on Page 53



Leading water meter manufacturer installs DETROITS to cut operating costs

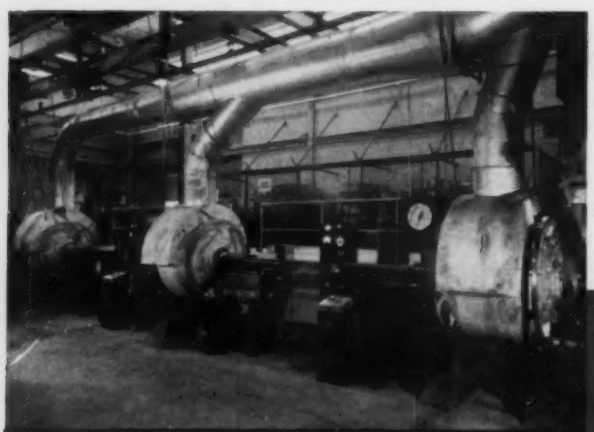


"The Detroit Electric Furnaces we recently installed are giving the fast melts and performance required. We expect even greater savings as we go along.

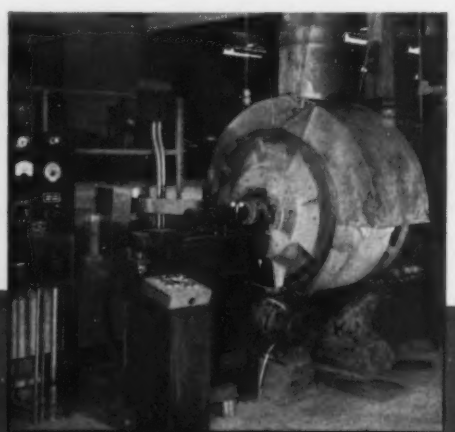
"These units give us new flexibility in our daily operations and control we never had in the past," says Charles M. Pate, foundry superintendent of the Hersey Manufacturing Company of Dedham, Massachusetts.

Hersey Manufacturing Company, one of the oldest leading manufacturers of water meters in the country, recently converted to three Detroit rocking electric furnaces as a step in reducing its foundry operation costs. Although it is too early for a complete tabulation of results, Hersey reports an appreciable savings in fuel cost, melt loss, maintenance and manpower. Hersey expects the Detroits to pay for themselves in a relatively short time—and its operating costs on the whole to be much lower now that Detroits are on the job.

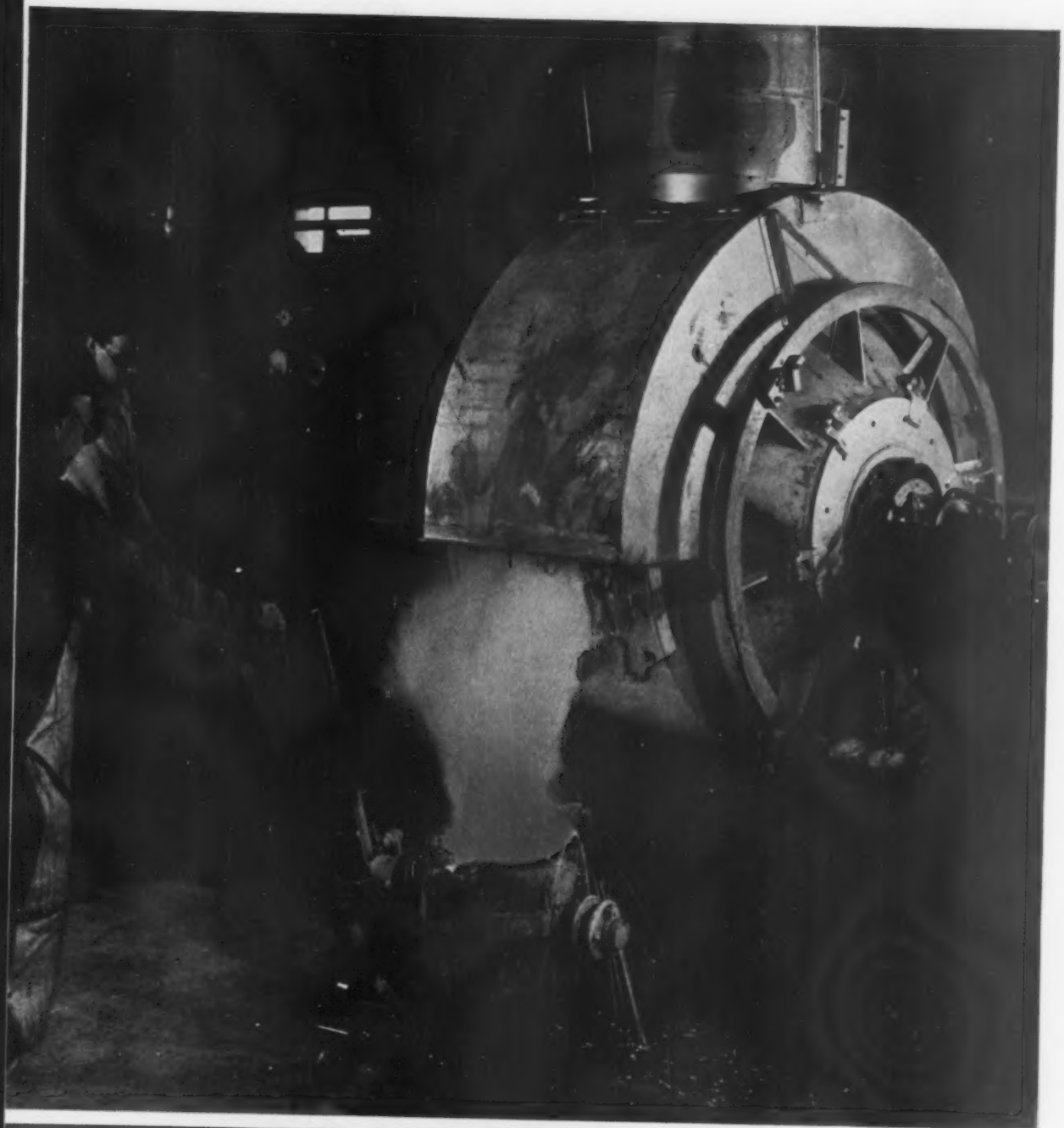
As Hersey is demonstrating, the place to cut foundry costs is right where they start—at the furnace. Send us your requirements. We'll gladly show you how Detroit Electric Furnaces cut operating costs.



A battery of three 700 lb., 175 KW Detroits give Hersey a steady stream of fast melts. Continuous rocking action washes the metal over the refractory, fully utilizing heat. This motion also assures complete homogeneity. Automatic controls accurately repeat the cycle time after time.



Here is one of the three automatically controlled "rocking action" Detroit LFYP's installed by Hersey. Angle of rock can be set for any desired length of time. Electrode controls are also automatic.



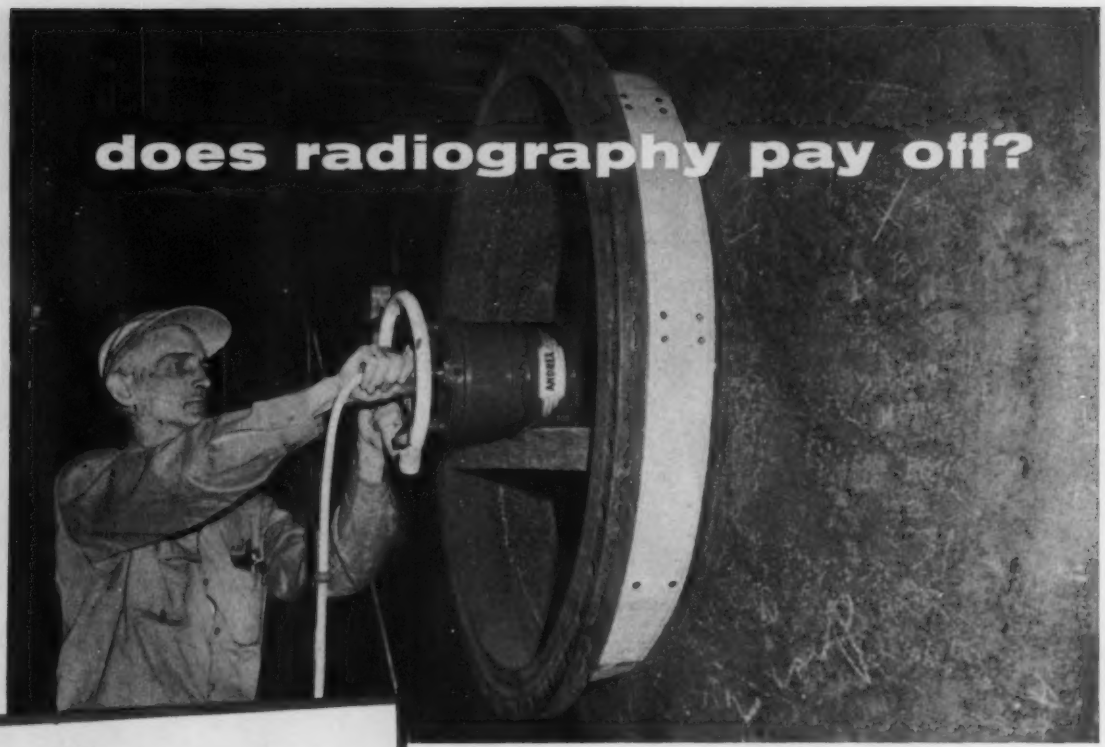
DETROIT ELECTRIC FURNACE DIVISION

Kuhlman Electric Company

Bay City, Michigan

Foreign Representatives in BRAZIL—Equipamentos Industrias, "Elso" Ltd., Sao Paulo; CHILE, ARGENTINA, PERU and VENEZUELA: AL Cassini Inc., 15 Broadway, New York 7, N. Y.; MEXICO: Cia Proveedora de Industrias, Atenas 32-13, Apartado 27A3, Mexico 6, D. F., Mexico; EUROPE, ENGLAND: Birlec, Ltd., Birmingham.

Circle 581 on Page 53



easy going.
The 64 lb. Andrex FT 360/160 KV unit here emits full-circle radiation: it will radiograph the entire girth weld of a vessel in one "shot". Films are held in place by a snap-on canvas band circling the neck.

x-ray is best for some jobs.
In that case the right machine for you probably lies somewhere in the comprehensive range of x-ray units listed below.

gamma ray (from radioisotopes) is better for others.
With one machine or another in the broad Picker line of isotope units you can radiograph anything from thin aluminum up to 10" thick steel.

unbiased advice free for the asking.
With an equipment line like that (nothing like it in the field) we have no axe to grind for any particular kind of machine: we can *afford* to be unbiased.

Does radiography pay off? Ask steel tank and pressure vessel fabricators—from now on in they couldn't *live* competitively without it.

Look: the new ASME code, Section VIII, ascribes 100% efficiency to a welded joint radiography-proved sound: the weld is considered strong as the mother metal even without stress-relieving. Which means that steel thickness of a radiographed vessel can be less than the thickness of a non-radiographed one.

Ergo: radiography can save tons of steel.
Ergo: radiography saves far more than it costs.

An extreme example? Hardly: hundreds of case records are as dramatic. Call in your local Picker man to find out what radiography (or fluoroscopy, maybe) can do for you. You'll find Picker offices in all principal cities (see local phone book) or write or wire us at the address below.

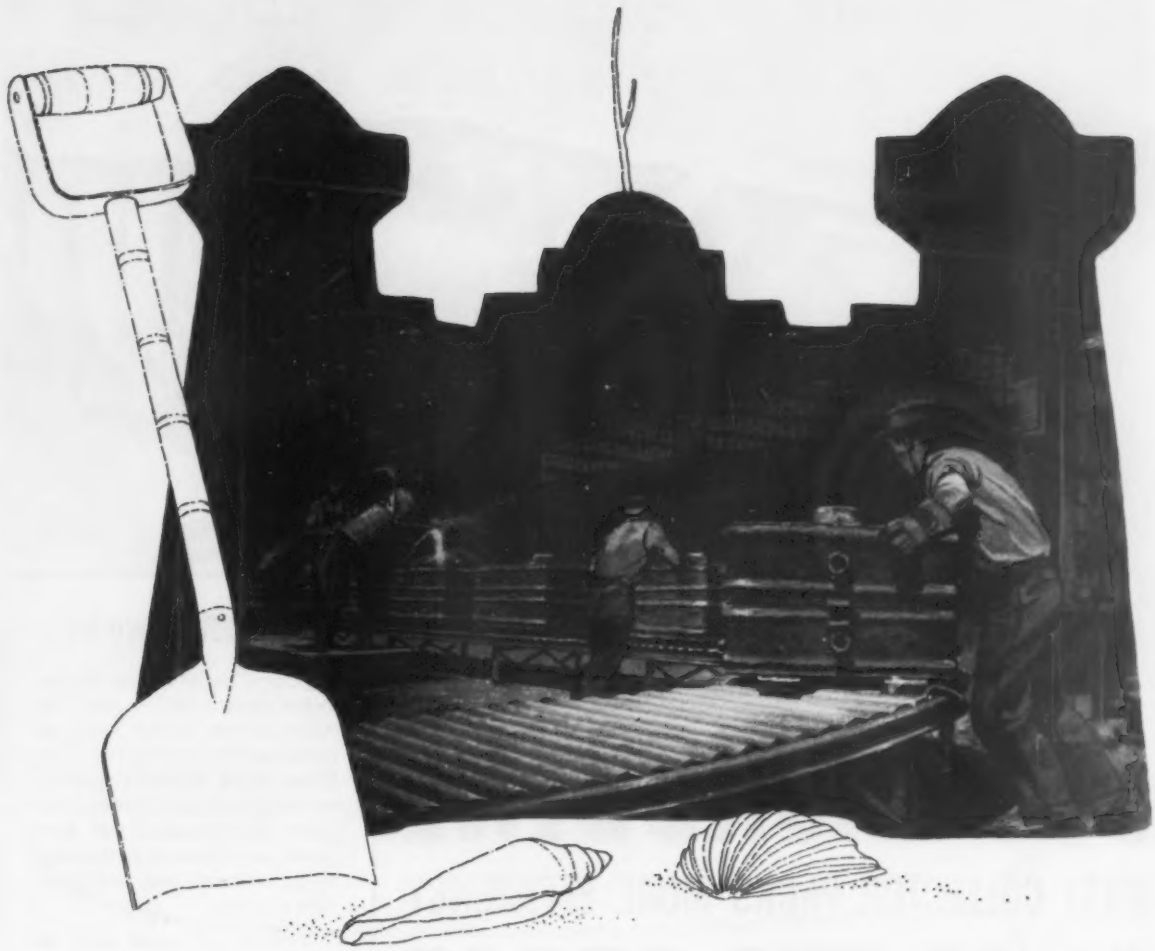
PICKER X-RAY CORPORATION
25 South Broadway, White Plains, N. Y.

Picker x-ray

one stop for everything in industrial radiography

ANDREX	portable x-ray units—130 KV, 140 KV, 160 KV, 200 KV, 260 KV
PICKER	x-ray units—35 KV Beryllium window, 90 KV, 150 KV (stationary and mobile), 270 KV portable, intensified image fluoroscopes
TECH/OPS	units for isotope radiography—sources, equipment, containers for Iridium ^{192} Cobalt ^{60} Thulium ^{170} and Cesium ^{137}
ACCESSORIES	. . films, tanks, darkroom sundries, illuminators, *everything*

Circle 582 on Page 53



Sand Castles in motion . . . intact

Cores and molds—the work-a-day sand castles of the foundry—require the smoothest conveyor ride you can give them. Anything less can result in costly breakage or even in undetected sand shifting—*undetected until the faulty casting appears.* One important protection against losses is a precision-engineered Logan Conveyor line.

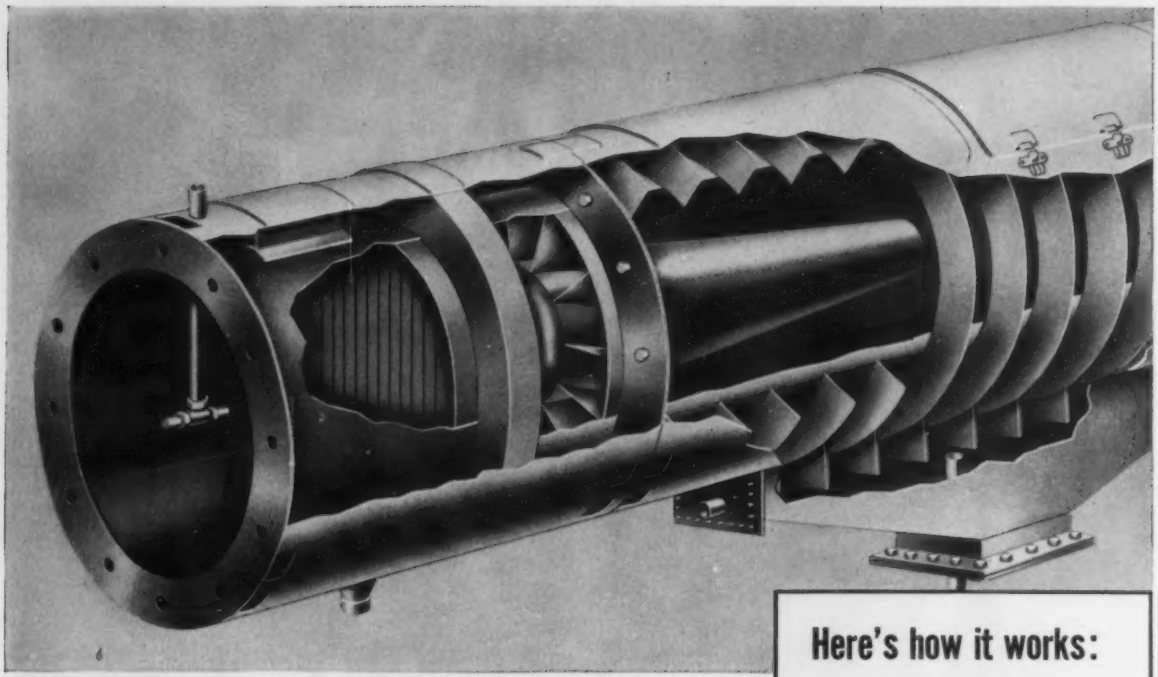
From core room to shipping, each line of a Logan Foundry Conveyor System is perfectly fitted to its job and built to give long dependable service under the loads it must handle. That means the utmost precision where it is needed, and it also means the lowest feasible over-all cost.

"The Man from Logan"—a highly trained field engineer in your area—is your source for a custom Logan Conveyor installation. He is prepared to focus two generations of Logan experience directly on your job. "The Man from Logan" is fully qualified to take over on design and specification and see your job through to smooth operation. Call or write us today for a visit from this specialist.

"The Man from Logan"

Logan Conveyors

LOGAN CO., 580 CABEL ST., LOUISVILLE 6, KY.



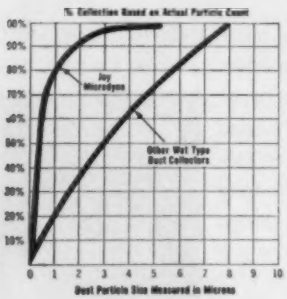
Here's how it works:

a spray of liquid enters the collector along with the dust. An impingement screen helps to encase each particle with liquid. Then fixed vanes impart a whirling motion to the wet, dust laden air. Moisture and dust particles are thrown to the sides by centrifugal force and drain into a sump.

The liquid used may be water, oil or solvents, depending on the material being collected.

JOY MICRODYNE®

DUST COLLECTOR PACKS MORE EFFICIENCY IN 1/10 THE SPACE



By combining two proved principles of dust collection, the Joy Microdyne collects over 99% by weight of dust particles 5 microns and larger; 92% of 2-micron dust. This means cleaner air.

Because of its unique design the Joy Microdyne is extremely compact . . . 1/10 to 1/20 the size of conventional wet collectors. For example: an 8000 cfm unit is only 26″ in diameter, 130″ long. This means lower initial cost and easier installation . . . in fact, the Joy Microdyne can be installed as part of existing ductwork.

Let us know about your dust collecting problems by describing the type of dust, approximate particle size and cfm required—and write for free bulletin 317-13.

AIR MOVING EQUIPMENT FOR ALL INDUSTRY

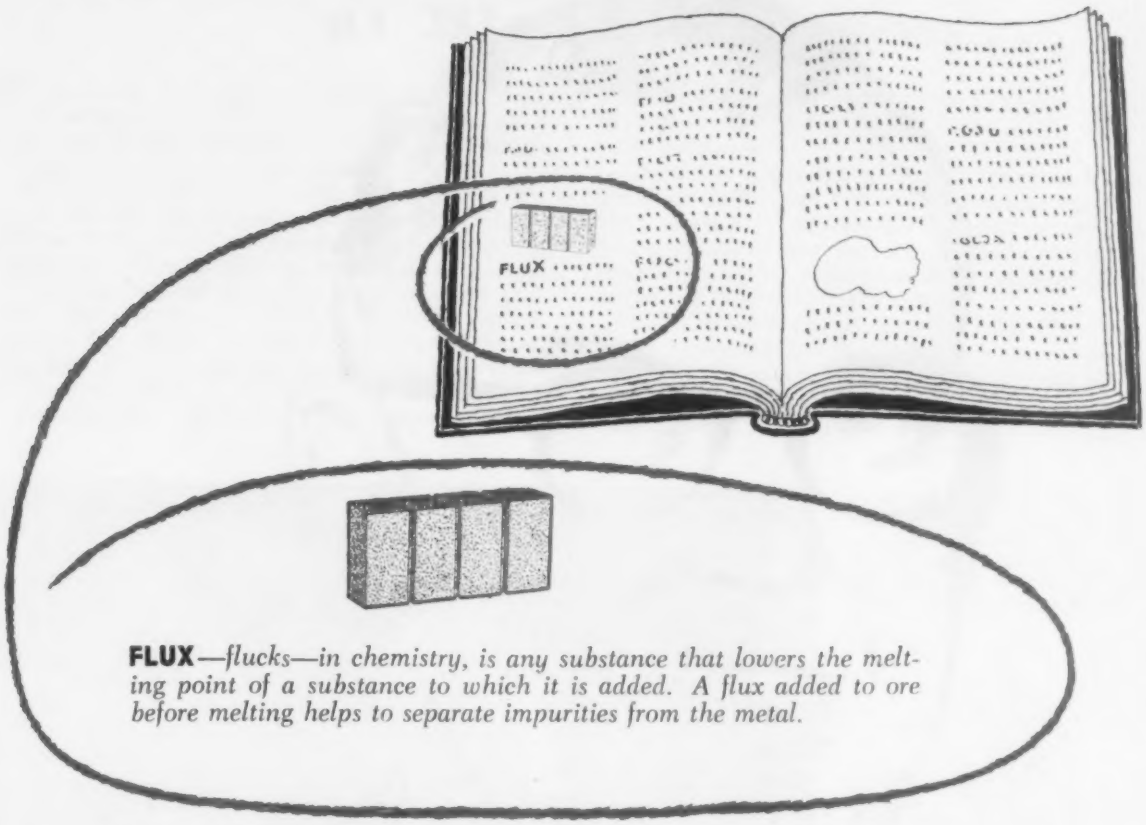
JOY

Joy Manufacturing Company
Oliver Building, Pittsburgh 22, Pa.

In Canada: Joy Manufacturing Company (Canada) Limited, Galt, Ontario

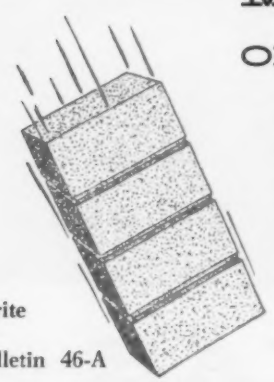
WSW 17878-317

Famous Encyclopedia says this about FLUX



FLUX—*flucks—in chemistry, is any substance that lowers the melting point of a substance to which it is added. A flux added to ore before melting helps to separate impurities from the metal.*

EXPERIENCE in Gray Iron and Malleable Foundries points to one FLUX in particular . . .



Write for Bulletin 46-A

Famous CORNELL CUPOLA FLUX

Famous Cornell Cupola Flux is a scientifically prepared mixture of high-grade fluorspar and other materials which create a chemical reaction in molten iron by greatly increasing slag flow off. Iron is cleaner, castings have greater tensile strength and are easier to machine.

If you melt Aluminum, Copper or Brass, try Famous CORNELL Aluminum, Copper and Brass Flux.

don't accept substitutes

The CLEVELAND FLUX Company

1026-40 MAIN AVENUE, N. W. • CLEVELAND 13, OHIO

Manufacturers of Iron, Semi-Steel, Malleable, Brass, Bronze, Aluminum and Ladle Fluxes—Since 1918

FAMOUS CORNELL FLUXES

Trade Mark Registered

How Howard Beacham licked

Howard Beacham has been a Bay State Abrasive Engineer for fifteen years and his total experience is double that. He's worked on grinding problems that have involved every type of metal in jobs as tiny as miniature bearings and as big as the world's largest air compressors and steam turbines.

a king-size cut-off problem at Black-Clawson . . .

It's one thing to cut half-inch gates and risers off small castings but, when you have to cut through a solid foot of high strength cast iron, the problems of heat and wheel-wear are no joke.

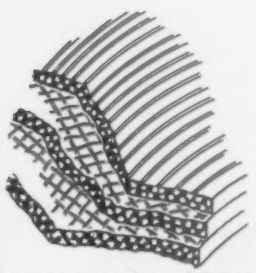
At The Black-Clawson Co., Inc., Watertown, N. Y., one of the World's biggest manufacturers of paper-making machinery, they regularly have to trim up castings as heavy as 3500 lbs. with risers as thick as 12" in diameter. So when Bay State research produced the now famous BZ2AA reinforced cut-off wheel, Bay State Abrasive specialist Howard Beacham saw to it that several samples were tried at Black-Clawson.

Results? Well, as Foundry Superintendent Ted Frazell says: "It isn't exactly the same as a knife through butter, but it's the fastest cut-off wheel *we've* ever seen."

"Safety is important too," adds Cleaning Room Foreman C. W. Shay. "A man doesn't do his best work when he's gun-shy the way you get with a wheel that shatters on you if it gets twisted a little. But the boys in my department have real confidence in this BZ2AA. They *know* it's safe."

Like Howard Beacham, your local Bay State factory representative or distributor is a trained abrasive specialist . . . a problem-solver who can often save you time, trouble and money. *Better grinding at lower cost . . . that is his business.*

(*Left*) Operator Leo Busler regularly takes slightly over two minutes to cut a 12" riser off a 3500 lb. dryer head casting. He uses a Bay State 24x5/16x1-3/4 BZ2AA abrasive cut-off wheel.



Cut-away section of BZ2AA wheel shows reinforcement between layers of bonded abrasive. Improved Bay State bond formulation and bonding technique result in accurate control and close matching of wear rates of all three major components of wheel . . . bond, reinforcement and abrasive.

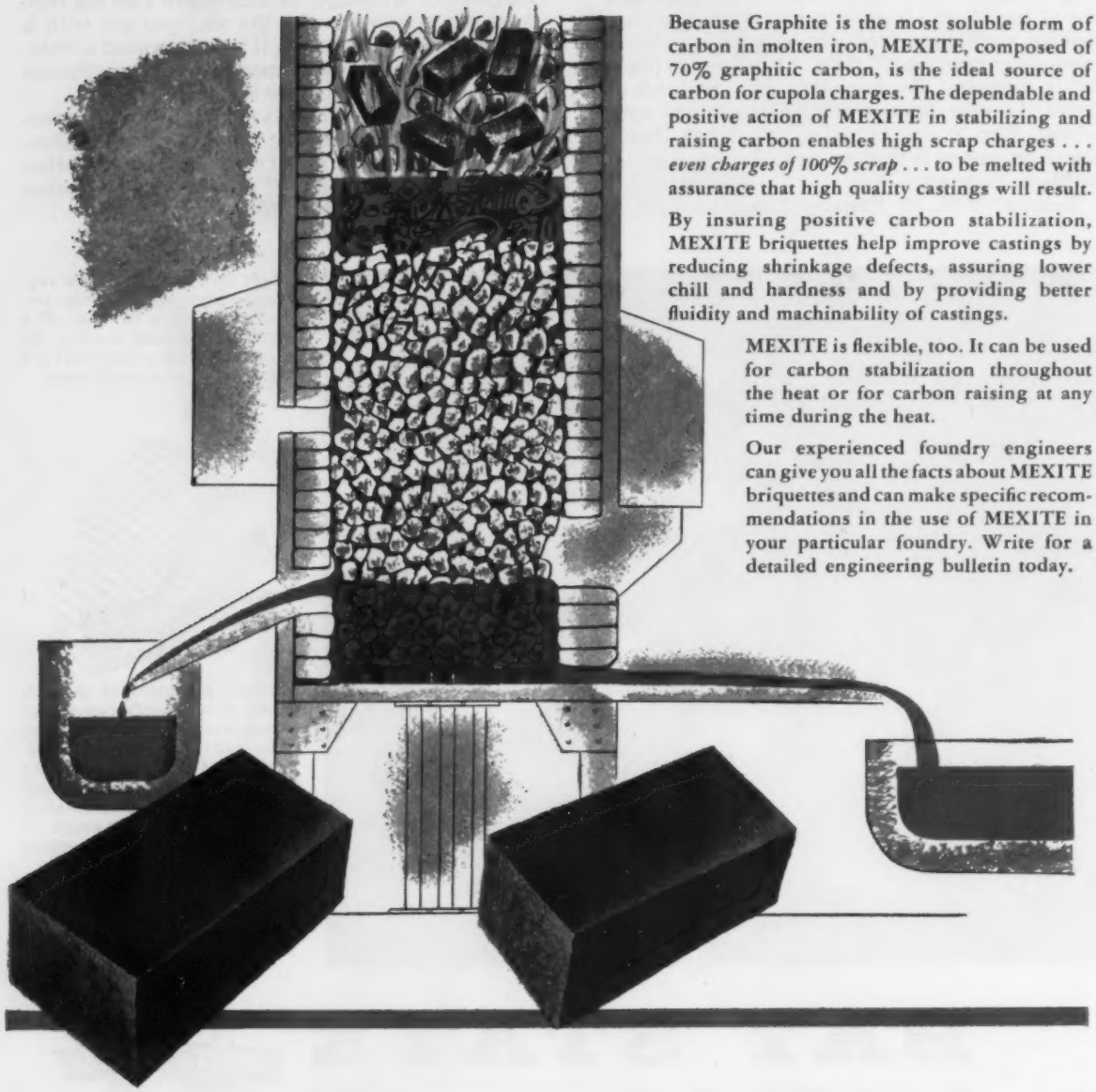
BAY STATE ABRASIVES

BAY STATE WHEELS of PROGRESS

Bay State Abrasive Products Co., Westboro, Massachusetts.
In Canada: Bay State Abrasive Products Co., (Canada) Ltd., Brantford, Ontario.
Branch Offices: Bristol, Conn., Chicago, Cleveland, Detroit, Pittsburgh. *Distributors:* All principal cities.

Circle 586 on Page 53

YOU CAN CHARGE MORE SCRAP IRON AND GET HIGH QUALITY CASTINGS WITH MEXITE® (GRAPHITE BRIQUETTE)



Because Graphite is the most soluble form of carbon in molten iron, MEXITE, composed of 70% graphitic carbon, is the ideal source of carbon for cupola charges. The dependable and positive action of MEXITE in stabilizing and raising carbon enables high scrap charges . . . *even charges of 100% scrap* . . . to be melted with assurance that high quality castings will result.

By insuring positive carbon stabilization, MEXITE briquettes help improve castings by reducing shrinkage defects, assuring lower chill and hardness and by providing better fluidity and machinability of castings.

MEXITE is flexible, too. It can be used for carbon stabilization throughout the heat or for carbon raising at any time during the heat.

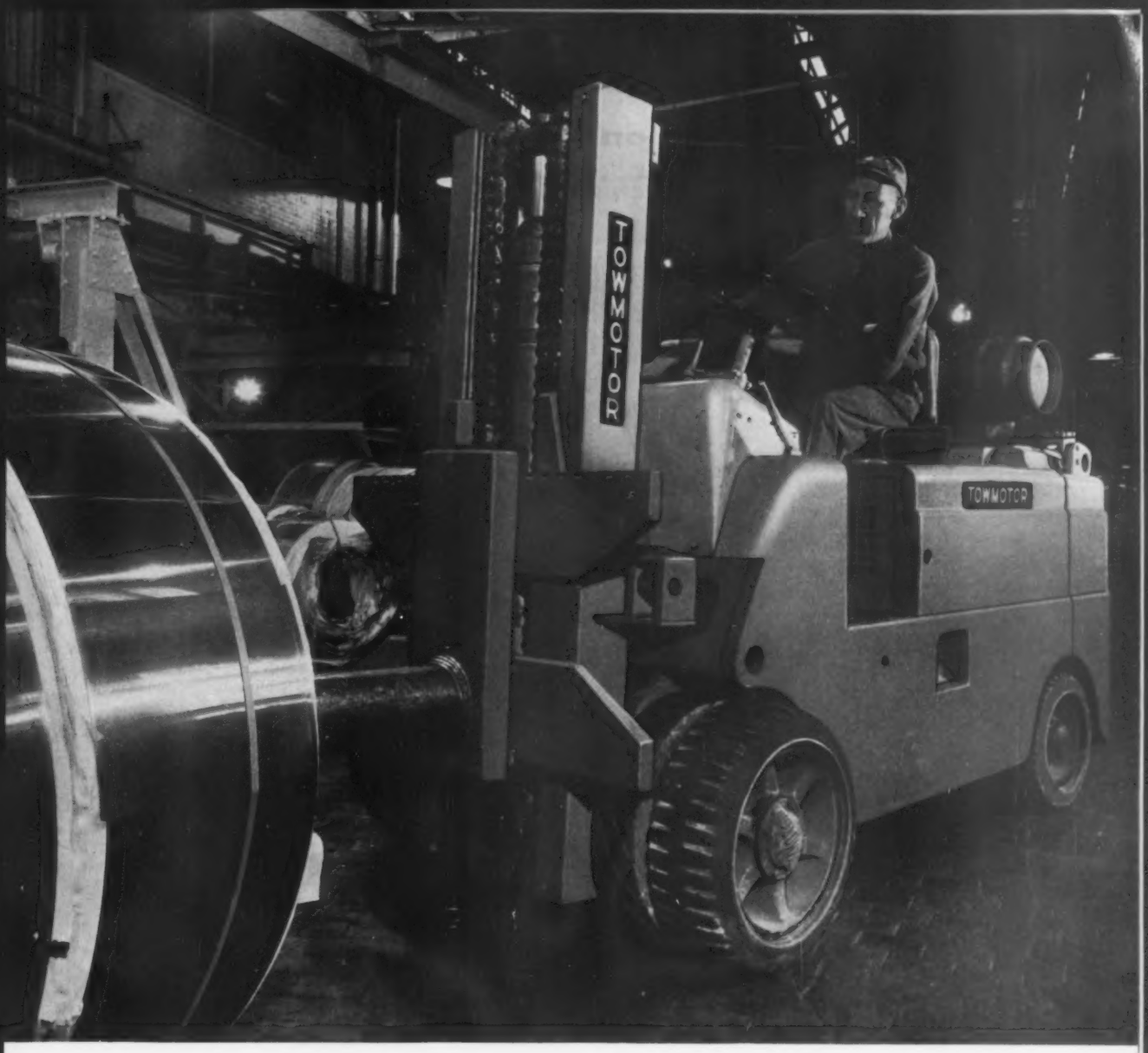
Our experienced foundry engineers can give you all the facts about MEXITE briquettes and can make specific recommendations in the use of MEXITE in your particular foundry. Write for a detailed engineering bulletin today.

262

THE UNITED STATES GRAPHITE COMPANY

DIVISION OF THE WICKES CORPORATION, SAGINAW 14, MICHIGAN

GRAPHITAR® CARBON-GRAPHITE • GRAMIX® POWDER METALLURGY • MEXICAN® GRAPHITE PRODUCTS • USG® BRUSHES



New Towmotor "Pace-Maker" Model Fork Lift Truck

Sets pace for fast flow!

Watch agile Towmotor lift trucks keep multi-ton loads flowing through busy, congested mills and factories—and you'll know why they lead the way in materials handling. Notice the fast pace they set for *every department* as they hustle all types of materials through receiving, production and shipping.

Discover why Towmotor lift trucks have the tough-as-nails stamina for *continuous operation*—cutting handling costs to bedrock day after day. Ask for new "Pace-Maker" Booklet SP-23 . . . and Certified Job Studies applying to your specific handling operations. (Also ask about new foot-controlled *Towmostatic Drive*, available now on some Towmotor models.) Write Towmotor Corporation, Cleveland 10, Ohio.

TOWMOTOR ® THE ONE-MAN-GANG — **-GERLINGER**

LEADERS FOR 40 YEARS IN BUILDING FORK LIFT TRUCKS, CARRIERS AND TRACTORS

Gerlinger Carrier Co. is a subsidiary of Towmotor Corporation

Circle 588 on Page 53

Thinking of automation?

The Universal Mold Conveyor is typical Jeffrey automation equipment – moves molds on the level, up, down and around.

Jeffrey builds single units and/or builds the entire system

Your men work at elevations best suited to each operation, with the Jeffrey universal mold conveyor on the job. Their tasks are eased and manufacturing efficiency is maintained at high levels, helping to boost earnings.

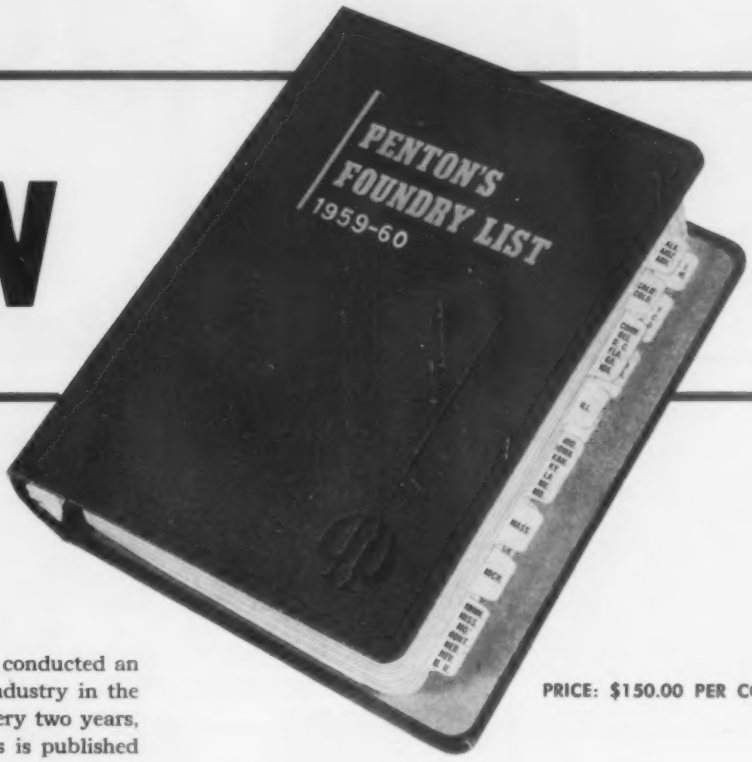
Flow of such materials as sand, castings, coke, limestone and iron borings is handled by Jeffrey vibrating feeders and conveyors, electric or mechanical types. They may serve as cooling conveyors, carrying castings from shakeout, and even the most fragile castings are handled safely.

Jeffrey mechanizes the handling of sand; overhead belt conveyors distribute sand to molders' stations, carry it from shakeout to Jeffrey sand conditioning plant and back to molders. Catalog 911 describes all of this foundry equipment. For a copy, write The Jeffrey Manufacturing Company, 907 N. Fourth Street, Columbus 16, Ohio.

JEFFREY

CONVEYING • PROCESSING • MINING EQUIPMENT...TRANSMISSION MACHINERY...CONTRACT MANUFACTURING

NEW



For many years, FOUNDRY has conducted an intensive census of the foundry industry in the United States and Canada . . . every two years, basic information on all foundries is published in . . .

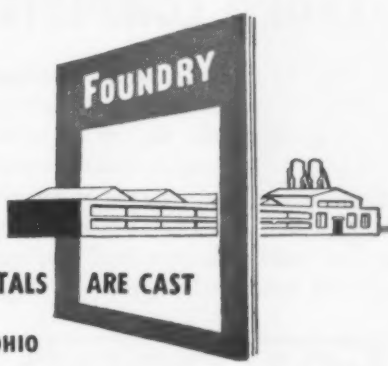
PRICE: $150.00 PER COPY.

PENTON'S FOUNDRY LIST and DIRECTORY

The new 1959-60 edition of PFL will soon be available (expected publication date, July 15). The new directory will give comprehensive information on all the 6,000 metal casting plants in the U. S. and Canada (including die casters). It will tell who they are and where they are located; what metals they cast, their melting equipment capacities, departments operated, etc.,

Well-indexed, and in loose-leaf form, PFL is indispensable to casting buyers and foundry suppliers. Send your order to: Book Department, FOUNDRY, 1213 West Third St., Cleveland 13, Ohio.

ORDER NOW FOR EARLY DELIVERY



Helping You Sell To Foundrymen

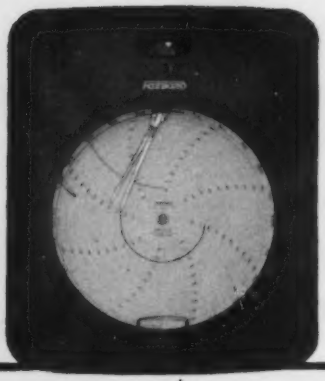
WHEREVER METALS ARE CAST

A PENTON PUBLICATION, PENTON BUILDING, CLEVELAND 13, OHIO

Circle 590 on Page 53

AIR WEIGHT CONTROLLERS

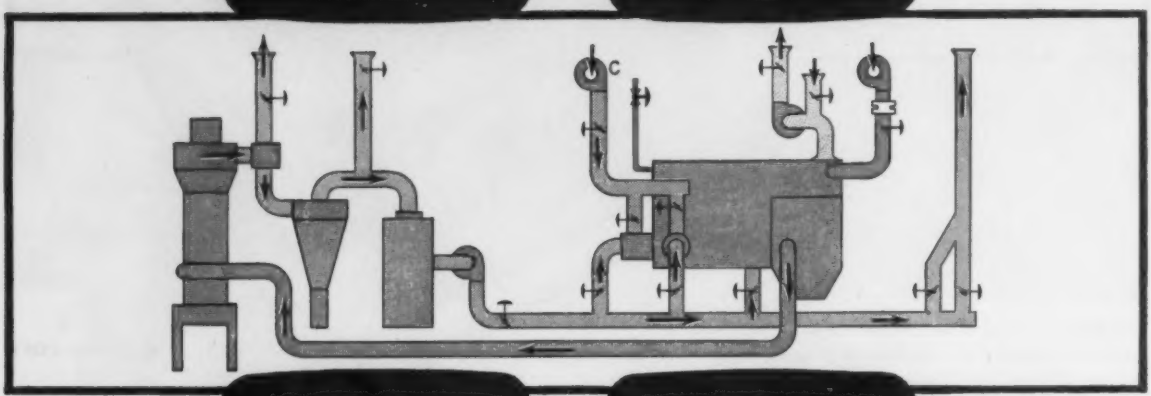
Performance-proved in more than 1700 successful installations. These popular Foxboro Controllers automatically "weigh" air for cupola blast . . . provide right amount of oxygen for best combustion regardless of weather conditions. Results: higher quality castings, greater productivity . . . fuel savings and less pigging.



DEW POINT RECORDERS — CONTROLLERS

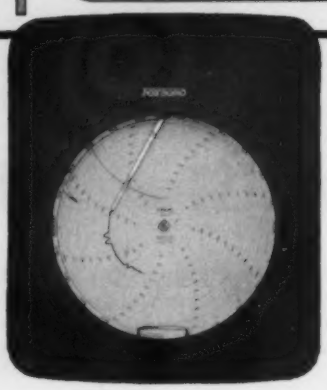
These Foxboro Instruments, with the exclusive Dewcel* measuring element, reduce coke waste and "cold metal" pours. Dew Point Recorders provide a foolproof basis for modifying the formula under varying humidity conditions. Dew Point Controllers automatically compensate for blast moisture variations on long-run heats.

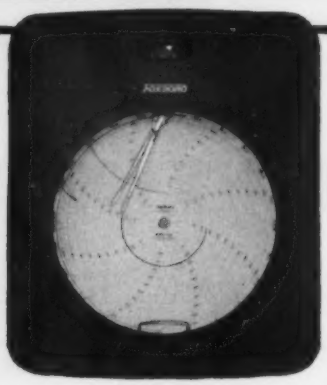
*Trade Mark



PRESSURE RECORDERS

These "trouble-shooting" recorders give operators a continuous record of cupola conditions . . . show-up clogged tuyeres, bridging, fine coke sizes, etc. They're dependable, accurate, trouble-free performers.





TEMPERATURE CONTROLLERS

For precise control of cupola start-up operation, windbox blast air, dust collector inlet gas, and hot air generator exhaust gases.

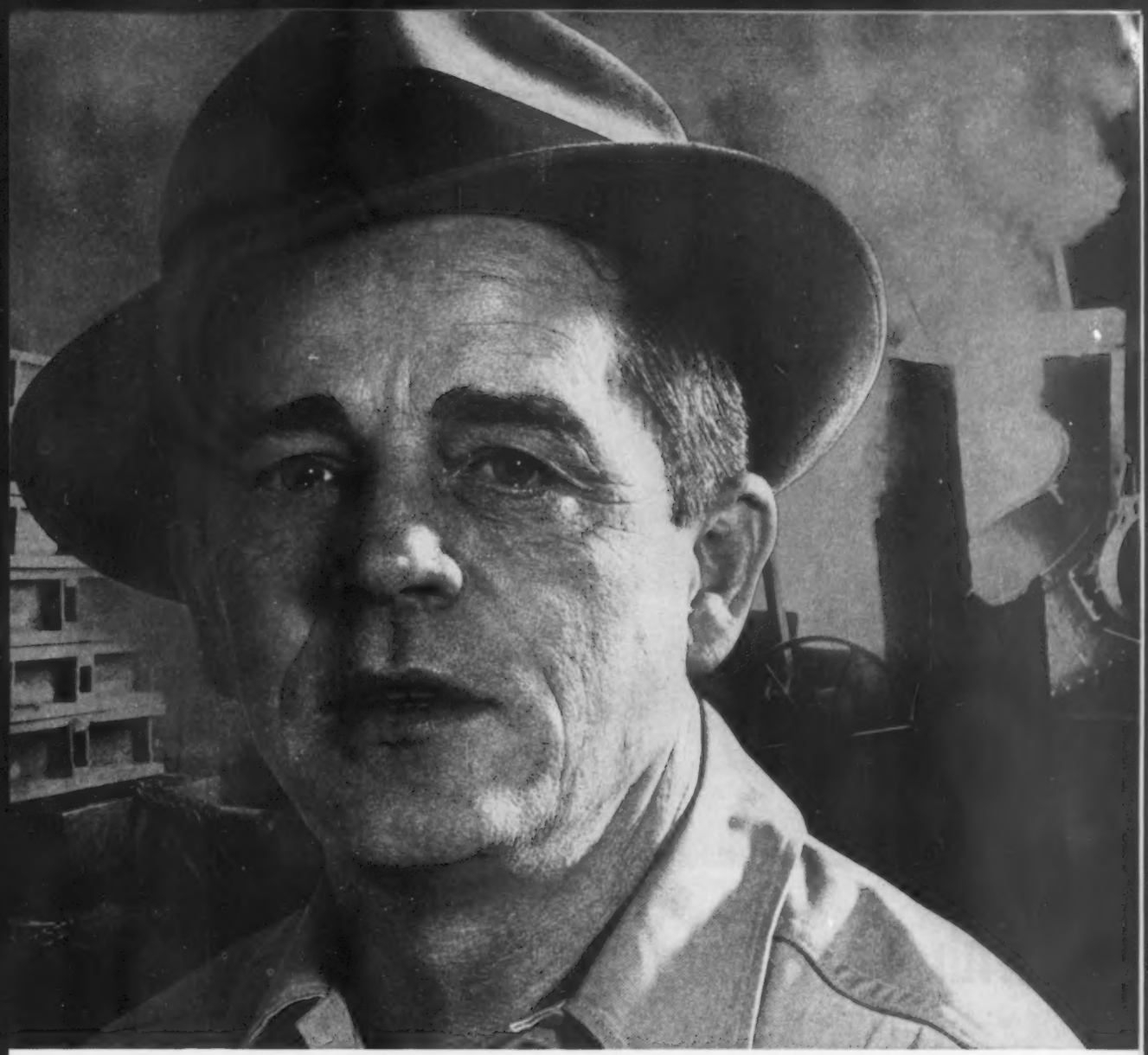
Increased efficiency . . . lower operating costs with **FOXBORO COMPLETE HOT BLAST CUPOLA CONTROL**

Measuring blast air by weight, correcting blast moisture variations, detecting Cupola bridging or tuyere clogging — these are just a few of the aids to better melts you can get with Foxboro Hot Blast instrumentation. Foxboro can furnish the complete instrumentation for any Hot Blast Cupola system — simple or complex. And every instrument used will be one that's been field-proved in hundreds of foundry installations. Ask your nearby Foxboro Field Engineer for full details — or write us direct. **The Foxboro Company, 327 Neponset Avenue, Foxboro, Mass.**

OTHER FOXBORO EFFICIENCY BOOSTERS

Blast Pressure Recorders
Auto-temperature Controllers for pre-heaters
Pressure Controllers for Exhaust Systems
Temperature Protection for Fans and Dust Collectors

FOXBORO REG. U.S. PAT. OFF. Complete Foundry Instrumentation



"It's the lowest cost alloy for ductile iron"

Foundries find that ELECTROMET magnesium-ferrosilicon is an economical, convenient source of magnesium for ductile iron. When added to a suitable composition, the alloy gives maximum ductility by promoting a matrix of soft ferrite. By adjusting the analysis, it can easily be used in high-strength irons having somewhat lower ductility.

Magnesium-ferrosilicon is available in grades with or without cerium. Cerium (0.5 or 2%) helps control unwanted residual elements which hinder the formation of spheroidal graphite. For further information and technical assistance, contact your UNION CARBIDE METALS representative.

UNION CARBIDE METALS COMPANY, Division of Union Carbide Corporation, 30 East 42nd Street, New York 17, N. Y.

Write for the folder, "Magnesium-Ferrosilicon for Ductile Iron."

UNION CARBIDE METALS

***Electromet** Brand Ferroalloys and other Metallurgical Products*

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Circle 592 on Page 53

With Mogul you can see the difference!

For years, experienced foundrymen have looked to Mogul Cereal Binder to help them consistently turn out top-quality cores. First choice in cereal binders, Mogul gives perfect green bond, offers unusual dependability in spite of usual wide variations in mulling time, types of sand, core shapes and sizes. Mogul provides high green strength; cores hold their shape during handling and storage. They give good collapsibility and easy shake-out, cutting down on strains and hot tears. The excellent permeability of Mogul reduces costly blows due to inadequate venting.

Today, teamed up with Dexocor the *dry* replacement for core oil, Mogul performs better than ever. For outstanding performance on green bond, green sand, for better blowing, easy ramming, easy shake-out, all-around improved handling and more efficient production, the combination of Mogul and Dexocor is unbeatable.

Your Corn Products technical representative is completely versed in the application of these and other binders and dextrines to mold and core making. Backed by years of experience, a completely equipped foundry laboratory, and the extensive facilities of the world's largest corn processor, our technical representatives will be pleased to work with you to help develop the combination of binders that's right for your needs. Call our nearest sales office or write direct.

MOGUL® cereal binder

CORN PRODUCTS SALES COMPANY 17 BATTERY PLACE, NEW YORK 4, N.Y.

Other fine products for the Foundry Industry: DEXOCOR® • KORDEK® binders • GLOBE® dextrines

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402	432	462	492	522	552	582	612	642	672	702	732	762	792	822	852
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417	447	477	507	537	567	597	627	657	687	717	747	777	807	837	867
418	448	478	508	538	568	598	628	658	688	718	748	778	808	838	868
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420	450	480	510	540	570	600	630	660	690	720	750	780	810	840	870
421	451	481	511	541	571	601	631	661	691	721	751	781	811	841	871
422	452	482	512	542	572	602	632	662	692	722	752	782	812	842	872
423	453	483	513	543	573	603	633	663	693	723	753	783	813	843	873
424	454	484	514	544	574	604	634	664	694	724	754	784	814	844	874
425	455	485	515	545	575	605	635	665	695	725	755	785	815	845	875
426	456	486	516	546	576	606	636	666	696	726	756	786	816	846	876
427	457	487	517	547	577	607	637	667	697	727	757	787	817	847	877
428	458	488	518	548	578	608	638	668	698	728	758	788	818	848	878
429	459	489	519	549	579	609	639	669	699	729	759	789	819	849	879
430	460	490	520	550	580	610	640	670	700	730	760	790	820	850	880

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411	441	471	501	531	561	591	621	651	681	711	741	771	801	831	861
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423	453	483	513	543	573	603	633	663	693	723	753	783	813	843	873
424	454	484	514	544	574	604	634	664	694	724	754	784	814	844	874
425	455	485	515	545	575	605	635	665	695	725	755	785	815	845	875
426	456	486	516	546	576	606	636	666	696	726	756	786	816	846	876
427	457	487	517	547	577	607	637	667	697	727	757	787	817	847	877
428	458	488	518	548	578	608	638	668	698	728	758	788	818	848	878
429	459	489	519	549	579	609	639	669	699	729	759	789	819	849	879
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Cleveland 13, Ohio

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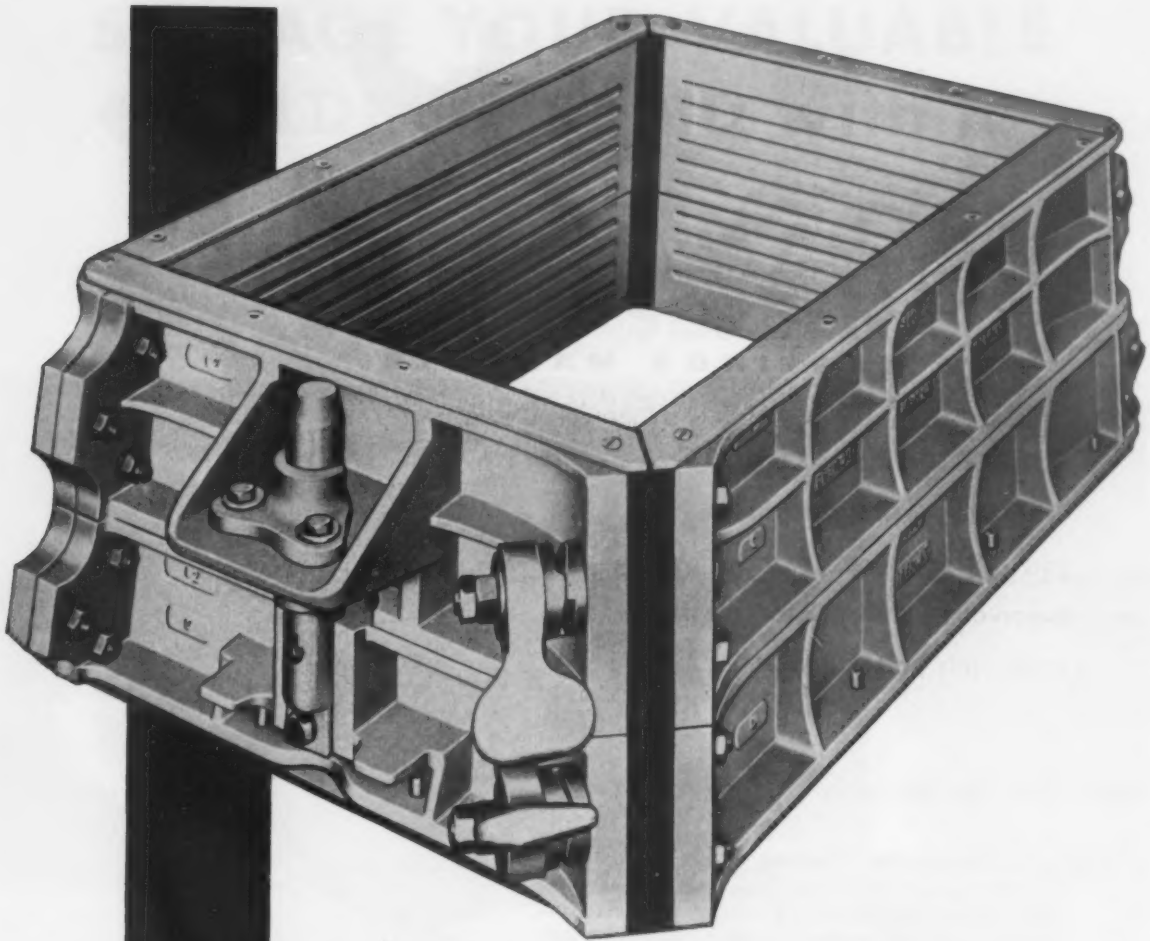


FREMONT'S SPREADLOCK FLASKS

This is a personal note from the manufacturer to inform you that these accurately machined flasks have tremendous corner strength. They are made of magnesium..... cams are hardened steel forgings. Spreadlock Flasks available in all convenient sizes.....

FREMONT FLASK CO.

FREMONT, OHIO

Circle 594 on Page 53

BROADEN

YOUR CASTINGS MARKETS

with the Magnaflux 4-Point Program that helps you sell more castings at lower cost-"tested" for the best on-the-job performance

Ferrous and nonferrous including the increasingly popular aluminum, too.

Here's What the Magnaflux 4-Point Program is:

1. Improve design for casting

With Stresscoat brittle coatings, make it easy for your customer to design *good* castings. You get "conversions," and hold present accounts with lighter castings that are easier to pour for more foundry profit at lower customer cost!

2. Establish useful standards

Make useful quality levels easier for you, by helping your customer specify critical tests only in areas needed! After Stresscoat work you know the few areas on the part that carry high stress, and the many areas where minor defects make no difference.

Base testing standards only on the need, to assure useful and reliable castings, — but not perfection. This applies to both ferrous and non-ferrous castings.

3. Gain better foundry control

With Magnaflux Test Systems you have a continuous check available from pilot casting to final production. You spot trouble fast and correct its cause. Finding pouring problems or the source of handling cracks saves the time and money wasted in processing castings destined for reject. You get more production, with less trouble!

4. Promote the reputation and acceptance of your castings

"Tested by Magnaflux" certifies that your castings are fully reliable for the service intended. This recognition helps create new uses for your castings, and more foundry customers.

The more you prove out the best on-the-job casting performance the more sales and higher profits you'll gain. Ask our Magnaflux Field Engineer to give you all the facts on our 4-point Program and how it helps you tap new markets. Write or call for a meeting. No obligation, of course.

These Magnaflux "Test" Tools will help you get them

MAGNAFLUX-MAGNAGLO
for magnetic metals.
Prices from $195.

ZYGLO
for nonferrous metals, stainless. Complete kits from $125.

STRESSCOAT
Shows where and how stresses occur, during design or pilot stage.

Y-5 YOKE KIT
Portable, lightweight magnetic particle testing. Complete kit only $195.

MAGNAFLUX CORPORATION
7350 W. Lawrence Avenue, Chicago 31, Illinois
New York 36 • Pittsburgh 36 • Cleveland 15
Detroit 11 • Dallas 35 • Los Angeles 22

The Hallmark of Quality in nondestructive test systems

Circle 595 on Page 53

SALVAGE YOUR VALUABLE MOLDING SAND with a SIMPLICITY RING-TYPE CRUSHER SCREEN

188

You profit two ways with Simplicity's Ring-Type Crusher Screens

- Your used core and molding sand is crushed and screened for re-use in one operation, saving the cost of new sand.
- Transportation and dumping costs of used sand are eliminated.

This unit combines the Simplicity heavy-duty vibrating screen with free-turning cast rings mounted over crushing plates. One to three sets of rings can be supplied, depending upon the maximum lump size to be crushed.

Simplicity ring-type crusher screens are paying their way in foundries producing magnesium, steel, malleable and grey iron castings throughout the United States.

Available in many models and sizes. For complete information write today for the name of our sales engineer in your area; and turn your waste into profits.

SALES REPRESENTATIVES IN ALL PARTS OF THE U.S.A.
FOR CANADA: Simplicity Materials Handling Limited, Guelph, Ontario.
FOR EXPORT: Brown and Sites, 50 Church Street, New York 7, N. Y.

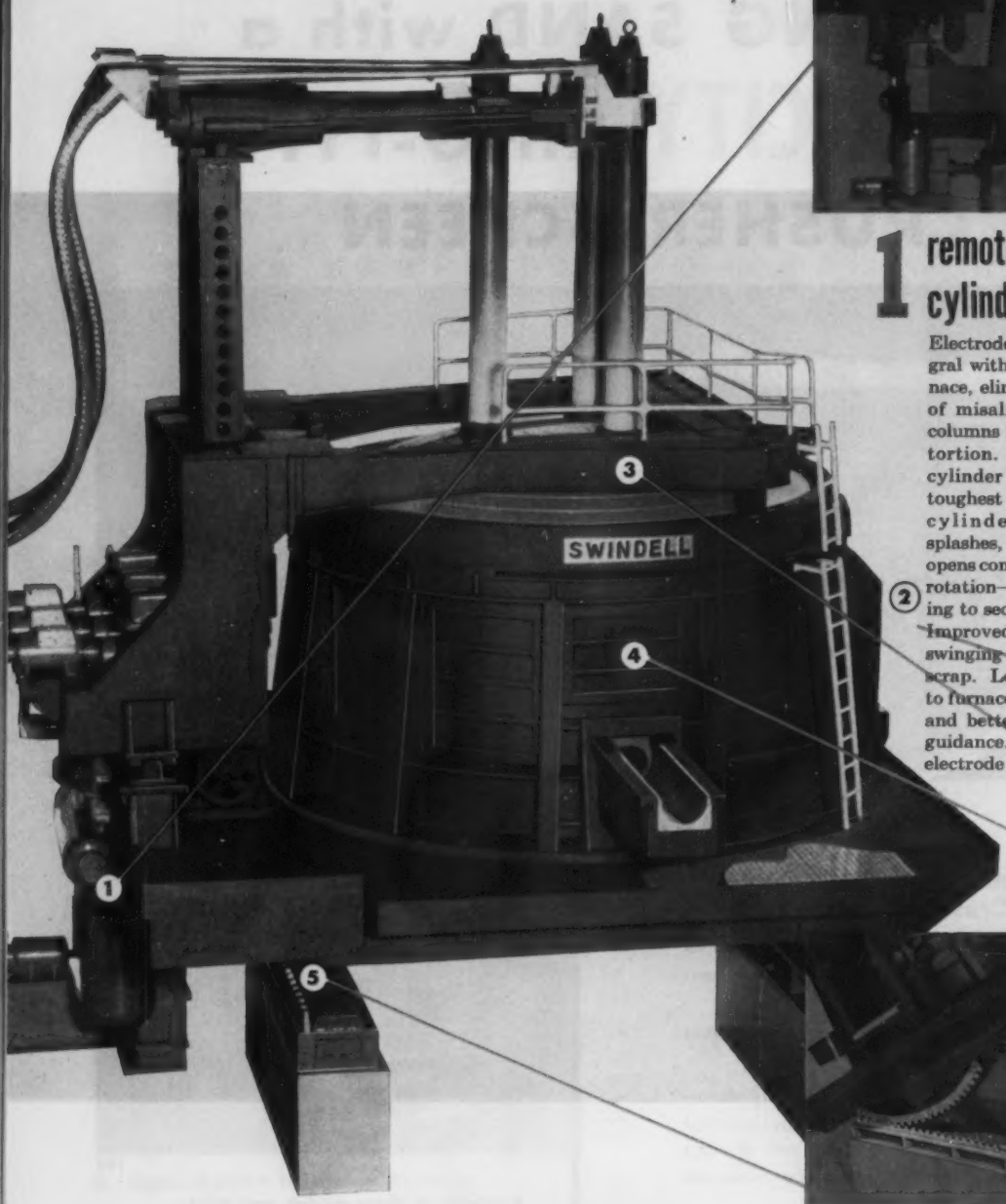
Simplicity
TRADE MARK REGISTERED

ENGINEERING COMPANY • DURAND 7, MICHIGAN

Circle 596 on Page 53

1 remote roof cylinder mounting

Electrode superstructure integral with tilting portion of furnace, eliminates any possibility of misalignment of electrode columns from shell or roof distortion. Rugged time proven cylinder for plowing through toughest scrap. No damage to cylinder from hot metal splashes, scrap or runouts. Roof opens completely with minimum rotation—no cross-over and fouling to secondary flexible cables. Improved lift stroke facilitates swinging roof over pyramided scrap. Low center of gravity to furnace. Improved wheelbase and better protection for mast guidance. Shorter, more rigid electrode arms.



5 mechanical tilting

Eliminates the foundation expense, fire hazard, mess, and maintenance of hydraulic cylinder tilting. Provides variable speeds of tilt to 1° per second. Safe, dependable, time-proved —engineered to be out of danger of damage by hot slag, runouts, etc. Minimum maintenance, maximum accessibility. Fail-safe design permits emergency manual tilting from safety of operating floor.

ENGINEERING SERVICE

Swindell-Dressler Corporation provides a complete engineering service for the metals industry in the design and construction of new plants, and modernization of existing facilities. Consultations arranged gladly on request.

The features that make perfection
IN ELECTRIC ARC MELTING PERFORMANCE

2 flush door mechanism

Permits rapid charging through fast, accurate placement and removal of charging bucket without maneuvering. Prevents damage by charging bucket or magnet to door guides, hoist mechanism and drives. Door cheeks and guides are designed to permit greater access to all of hearth area for maintenance.

3 3 point roof suspension

Distributes roof load equally to water-cooled roof suspension beams—prevents roof ring distortion in lifting—permits roof to "float," safeguarding electrode alignment if shell sidewalls expand, yet is rigid in horizontal plane to guard against damage if swinging roof collides with pyramiding scrap. Oversize diameter roof ring of exclusive I-beam design.

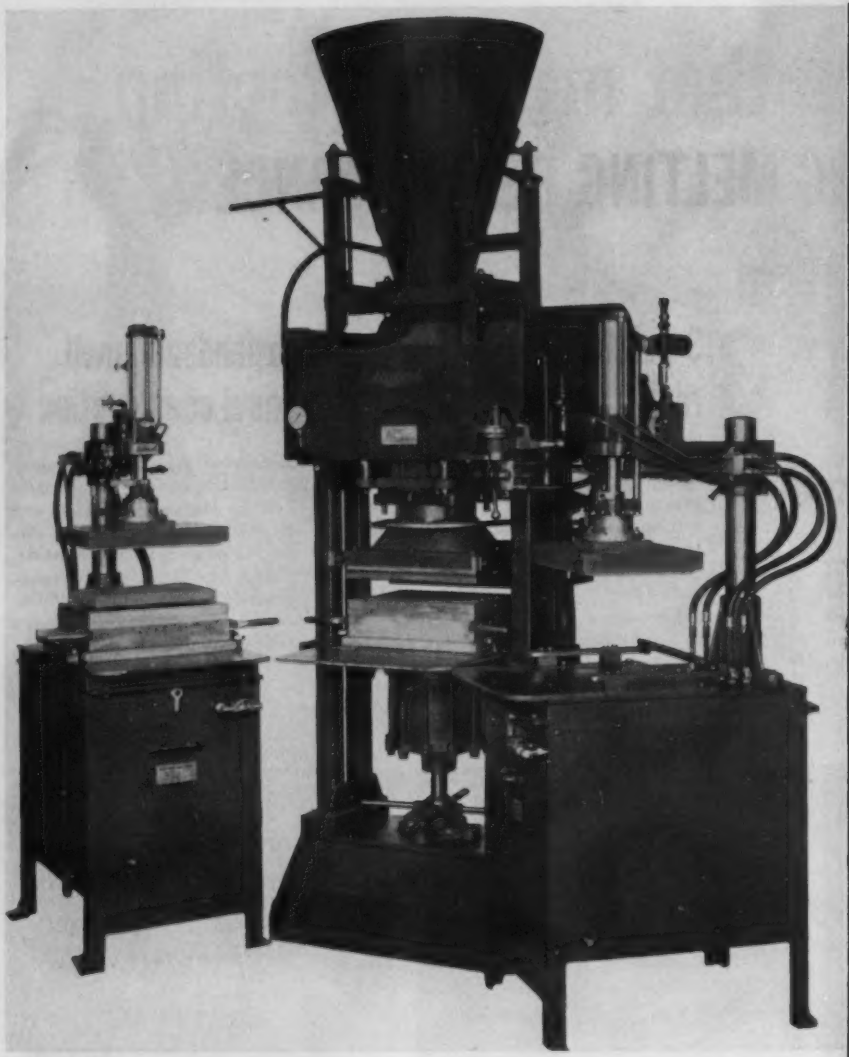
4 expendable shell panel construction

Localizes any shell damage—safeguards balance of furnace and its alignment. Panels can be easily replaced without disturbing refractory sidewalls. Panels can "breathe" for expansion and contraction. Water-cooled annular ring ties heavy buckstays at parting line.

SWINDELL
ELECTRIC ARC MELTING FURNACES

SWINDELL-DRESSLER CORPORATION
DESIGNERS AND BUILDERS OF MODERN INDUSTRIAL FURNACES
PITTSBURGH 30, PA.

Circle 597 on Page 53



REDFORD CO_2 MOLD MAKING EQUIPMENT

Here is a proven way of applying the CO_2 process to the production of small castings. With the above Redford #420-D Core Blower and (2) Model H-2-M Gassing Stations, one mold is being blown and squeezed while another one is automatically gassed and stripped. Up to 80 complete molds (cope and drag) are produced in one hour. Molds are flat and can be stacked for pouring. Metal yield is greatly increased. Very little floor space is required. Millions of small parts have been cast to close tolerances at reduced costs. For complete information write for BULLETIN No. 421.

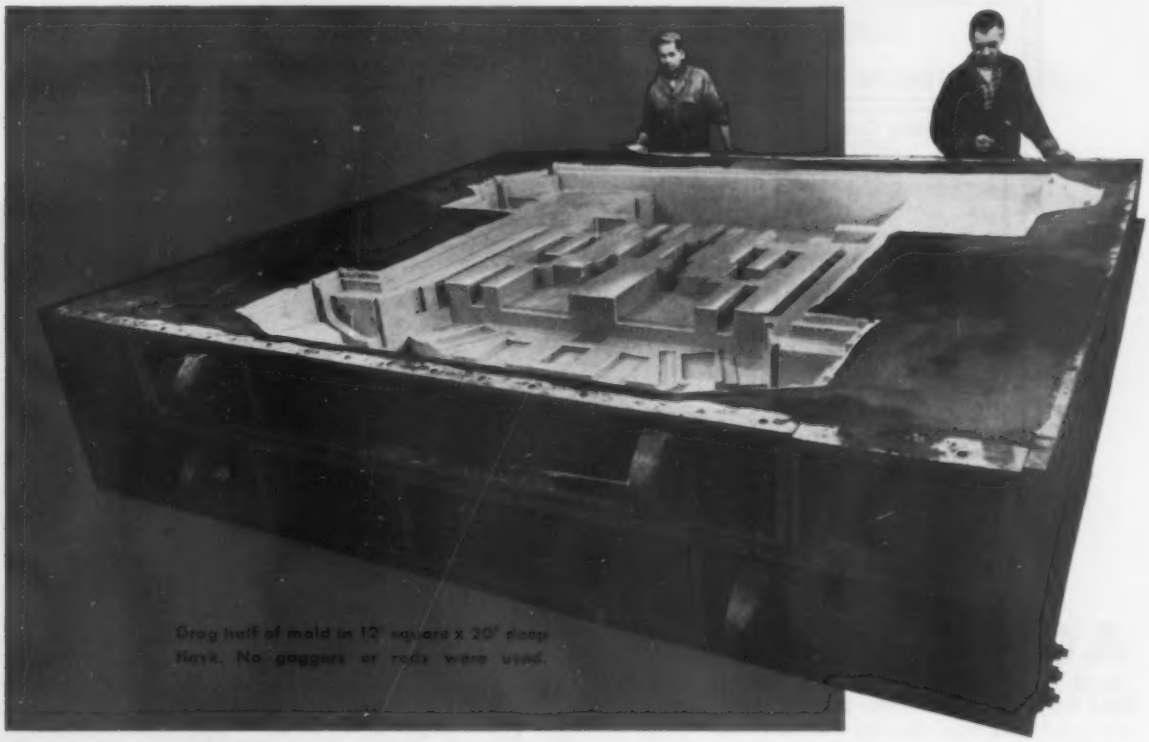
Redford **IRON & EQUIPMENT CO.**
20733 Glendale • Detroit 23, Michigan
Phone: KEnwood 1-8611

TYPICAL CO_2 MOLD CASTINGS

½ Actual Size

SPECTACULAR RESULTS

in casting automotive dies



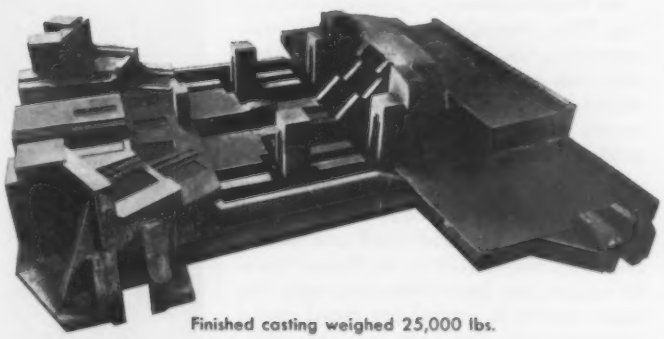
Schneider, Bowman Co., Inc. of Philadelphia is using Kold-Set Binder to achieve significantly improved dimensional accuracy in the production of die castings for the Budd Co.

In the casting shown, considerable machine time was saved due to close tolerances maintained in the making of the casting. The management at Schneider, Bowman Co., Inc. reports a 25% reduction in mold dressing time. Additional savings were realized in mold making in excess of 10%. 2% Kold-Set and 1½% iron oxide were used with 7,000 lbs. of sand. Before drying the mold received two coats of Kold-Set Zircon Wash. No oven baking needed, the mold being dried with a portable heater for eight hours at 450°F.

Let us discuss how the Kold-Setting Binder Process can reduce costs and improve dimensional accuracy of castings for you. *Write or phone!*

Write for Kold-Set Application Studies

Let us send you this new quarterly publication which shows how the Kold-Setting Binder Process is being used by progressive foundries.



Finished casting weighed 25,000 lbs.

KOLD-SET

PRODUCTS FOR FOUNDRY PROGRESS

G. E. SMITH, INC.

246 Washington Road Pittsburgh 16, Pa.

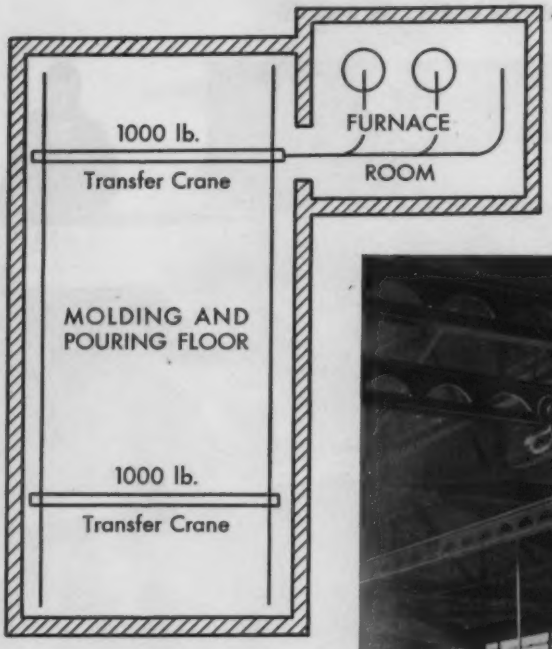
Warehouse Stocks in Chicago, Boston, Detroit, Philadelphia

Kold-Set is Patented in the United States

Circle 599 on Page 53

"Tramrail Cranes Lighten Load by 50%"

. . . declares foundry foreman



Hot metal is conveyed from furnaces to molds in fast time. Therefore, temperature drop is held to a minimum. Tramrail extended hand-wheel chain hoists permit lifts being made with the operator standing a safe distance from the molten metal.

A 240-LB. crucible for hand pouring, when full of hot metal, weighs with shank about 300 lbs. This is a heavy load for two or even three men to carry by hand and hold during the pouring of perhaps 20 to 40 molds.

At The Seagrave Corporation, Columbus, Ohio, manufacturer of fire-fighting apparatus, Cleveland Tramrail overhead materials handling equipment not only eliminates this hard work, but handles larger 750-lb. crucibles which speed production.

The Tramrail equipment consists of two transfer cranes over the molding and pouring floor and track and switch system in the furnace room. Either transfer crane can be interlocked with the track system to permit hot metal being delivered from furnaces to molds without rehandling.

The overhead equipment is also used for many other handling jobs such as moving flasks, sand, castings, etc. It reduces the time for this work and eases the burden on the foundrymen.

The foreman of the foundry declares, "These Tramrail cranes lighten the load by 50%. They are saving men's backs and making the work safer. Now the men don't take a lot of time off because of aches and burns."

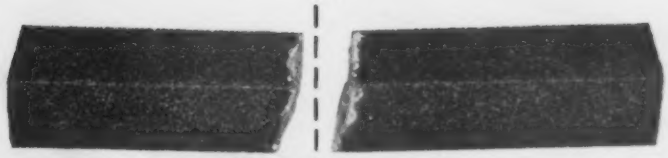
CLEVELAND TRAMRAIL

Overhead Materials Handling Equipment

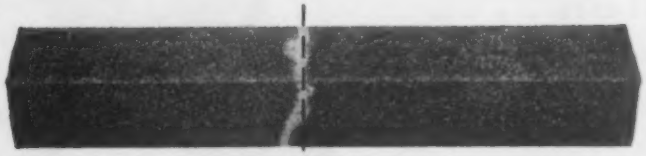
Write for free booklet—2008.

CLEVELAND TRAMRAIL DIVISION • THE CLEVELAND CRANE & ENGINEERING CO. • 3846 E. 286 ST. • WICKLIFFE, O.

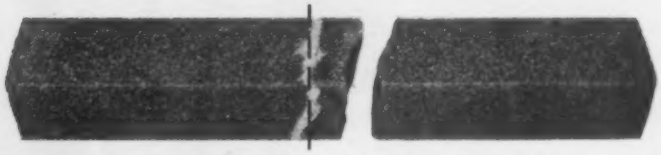
Circle 600 on Page 53



THE BROKEN ENDS OF A TEST CORE ARE COATED WITH DELTA CORE ADHESIVE



THE COATED ENDS ARE JOINED AND THE CORE ADHESIVE DRIED



WHEN AGAIN BROKEN . . . THE BREAK OCCURS AT OTHER THAN THE JOINT . . .

. . . PROVING THAT THE JOINT IS STRONGER THAN THE CORE WHEN MADE WITH

DELTA CORE ADHESIVE!

Delta Core Adhesives penetrate deep into the core surfaces to produce a weld-bonded joint many times stronger than the core itself . . .

. . . and core sections joined, or mended, with a Delta Core Adhesive are so completely bonded they never break or fracture at the joint.

Delta Core Adhesives are extremely low in gas forming properties which eliminates the danger of blows at a joint. They are completely stable . . . non-reactive with molten metal . . . and because they have a uniform coefficient of expansion with the sand, Delta Core Adhesives will not cause core distortion.

Delta Core Adhesives are available in ready-to-use liquid and paste forms and in easy-to-mix powder form. Each may be applied by dipping or brushing onto the surfaces to be joined then air or oven dried. When dry, Delta Core Adhesives resist moisture pick up.

THREE EASY-TO-USE TYPES
OF
DELTA
CORE ADHESIVES
FOR EVERY NEED AND PREFERENCE

•

READY-TO-USE LIQUID
DELTA GRIPTITE CORE ADHESIVE —
LIQUID

•

READY-TO-USE PASTE
DELTA 200-3X CORE ADHESIVE —
SOFT PASTE

•

EASY-TO-MIX POWDER
DELTA GRIPTITE CORE PASTE
Mix with water to any desired consistency.

OUR 26TH YEAR

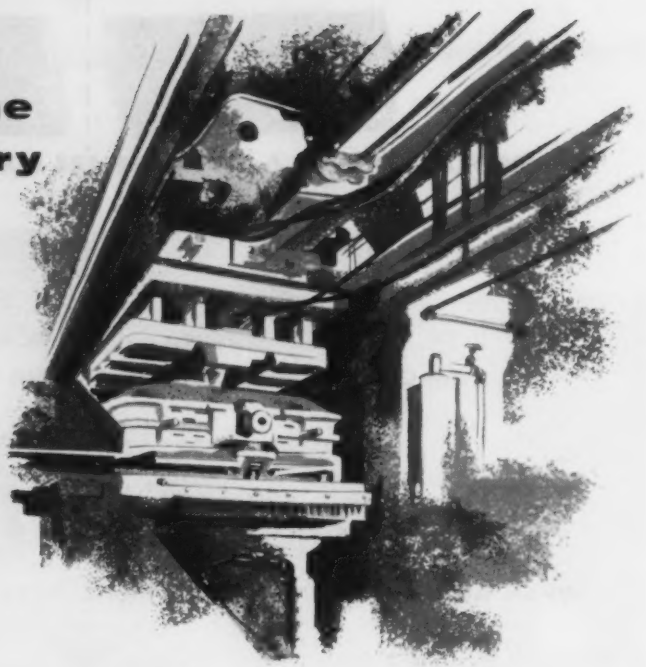
DELTA

Working samples of Delta Core Adhesives for test purposes will be sent on request together with instructions for use.

DELTA OIL PRODUCTS CORP.
MILWAUKEE 9, WISCONSIN

MANUFACTURERS OF SCIENTIFICALLY CONTROLLED FOUNDRY PRODUCTS

a type and size molding machine for every foundry operation . . . .



We have maintained a progressive attitude toward the development of new and better molding machines, for a basic reason:

There is a continuous need, and a market, for a type and size molding machine for *every* foundry operation.

Your requirements are somewhat different than your neighbor. His may be quite different than yours.

Everyone has a changing concept of the problems of automatic, semi-automatic or push-button molding procedure.

It is up to *us* to keep abreast of these fluctuating demands and design molding machines to fill the gap.

We are doing exactly this every day.

A good example is our MOLDMASTER machine, a unit designed with a new principle of simultaneous, hydraulic, self-adjusting squeeze heads. Jolt mechanism is optional, depending on your application. Sand is compacted in proper relation to the contour of the pattern, thereby producing perfect molds.

Wear on the squeeze head and pattern equipment is practically eliminated.

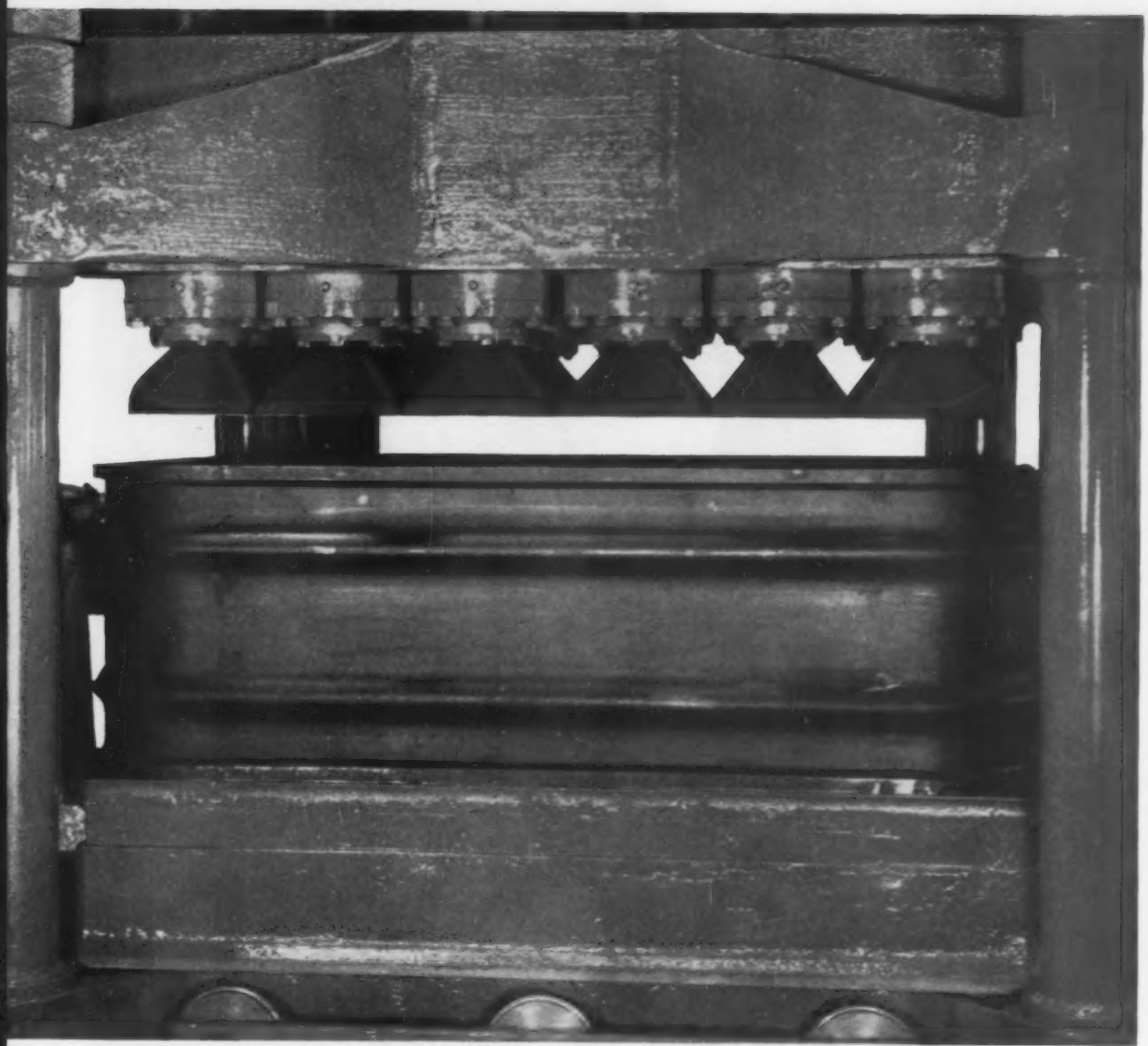
The MOLDMASTER is adaptable to various operating conditions . . . which serves to accelerate its amortization.

Technical Bulletin No. JSS-5-58 provides more details.

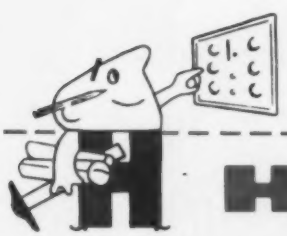
The MOLDMASTER is one in a complete line of 15 different Herman molding machines.

What type do *you* require?

HERMAN PNEUMATIC MACHINE CO., UNION BANK BUILDING, PITTSBURGH 22, PA.



Illustrating the self-adjusting pattern contour squeeze head principle on the HERMAN MOLDMASTER.

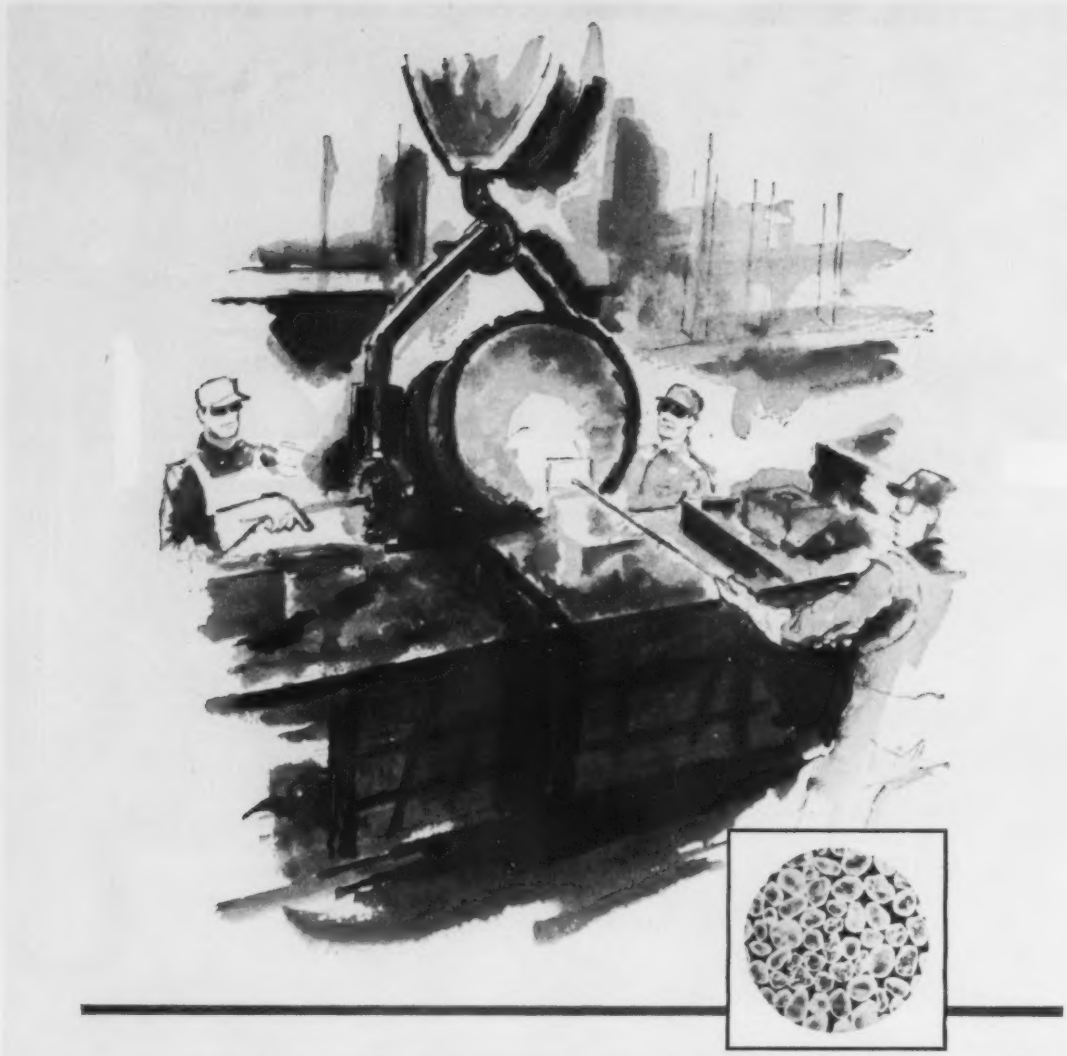


HERMAN

FOUNDRY EQUIPMENT MEMBER FEMA MANUFACTURERS ASSOCIATION INC

and most progressive

Best Known Name in Engineered Molding Machines



ALL THE MERITS OF ROUNDED-GRAIN QUALITY ARE YOURS WITH WEDRON SILICA...

We feel the name Wedron means a number of things to foundrymen: Quality, purity, rounded-grain structure, and a wide range of A. F. S. grades to choose from. Of these, quality and the rounded-grain advantages stand out. They tell you that Wedron Sands give you the basis for better controlled castings. Try Wedron today and experience better results.

WEDRON SILICA COMPANY

135 South LaSalle Street • Chicago 3, Illinois

Send for illustrated brochure on Wedron sands.

MINES AND MILLS IN THE WEDRON-OTTAWA DISTRICT

Circle 603 on Page 53

Circle 602 on Page 53

Union Casting Company, Middlesex, New Jersey, bought two Tabor Top-Squeezers in 1946. "Ten years of day-in-day-out production with pennies for maintenance" — that's the report of John von See, President.

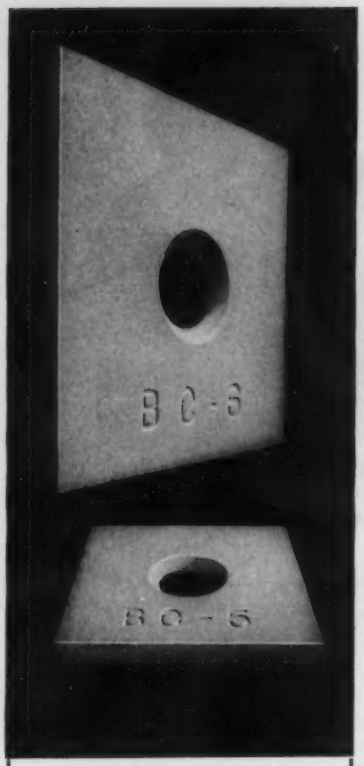
With this Tabor jolt-squeeze machine, the first cost is the lowest on today's market. Table size is 16"x19". Squeeze cylinder is 10" diameter. Squeeze pressure relief valve, to assure uniform density on similar molds, is optional. The squeeze unit is fully enclosed and off the floor — protected from sand, dirt and dust.

Each machine in the Tabor line has mechanized muscles to give you more castings per hour, less downtime per machine. Write for Condensed Catalog or ask to see the Tabor Man—the technical man.

TABOR

THE TABOR MANUFACTURING CO.
Division of Turbo Machine Company
LANSDALE, PA.

Circle 604 on Page 53



Louthan breaker cores cut foundry costs

You minimize casting problems, get cleaner castings when you use Louthan *refractory* breaker cores. They facilitate rapid removal of the riser, with subsequent labor savings. There is no core gas. Available for all riser diameters from 2″ to 12″, and for use with *any metal casting* risering from a flat surface.

Write for Free Gating and Risering Refractory Folder. Complete file of specifications on all Louthan products.

LOUTHAN
MANUFACTURING COMPANY
A DIVISION OF FERRO CORPORATION
EAST LIVERPOOL, OHIO

Circle 605 on Page 53

Readers' Comment

Late in the Mail
To The Editors:

Ever since I became a personal subscriber to Foundry I have become accustomed to receiving my copy of the magazine on the first or second of the month.

Today is May 7, and I have not, as yet, received this month's issue. I have contacted the Post Office and they were unable to find my copy of Foundry.

It may be that I have been over anxious and that an unavoidable delay in publication and distribution has been encountered.

Harold B. Gardner
The Chalfonte, Apt. 303
1601 *Argonne Place N.W.*
Washington 9, *D. C.*

Editor's Note: To report on the AFS convention and show, Foundry went to press a week late, and did not mail until May 4.

A Close Relative
To The Editors:

In Foundry I keep seeing references to "Who Has 'Handle Bar Harry'?"

I don't think we ever employed "Handle Bar Harry"—but I am sure that at one time (back prior to 1920) we had some close relatives of his.

The enclosed photograph—which (as closely as I can tell) was taken about 1918—proves my point.

I would appreciate having the photograph returned to me when it has served your purpose.

R. L. Gilmore
President
Superior Steel & Malleable Castings Co.
Benton Harbor, Mich.

Like New Again
To The Editors:

Many thanks for the information on a cleaning compound to remove the weathering effects on cast brass plaques (June issue). I have used it with splendid results, and the plaques look as if they were cast recently.

Mrs. Alice Obrien
1403 41*st Ave.*
San Francisco, Calif.

Wrong Address
To The Editors:

The April issue of Foundry in "Men of Industry" announced my election as vice president-sales manager of Branford Co. However, you indicated we were in New Haven when our address since Feb. 1 has been in New Britain.

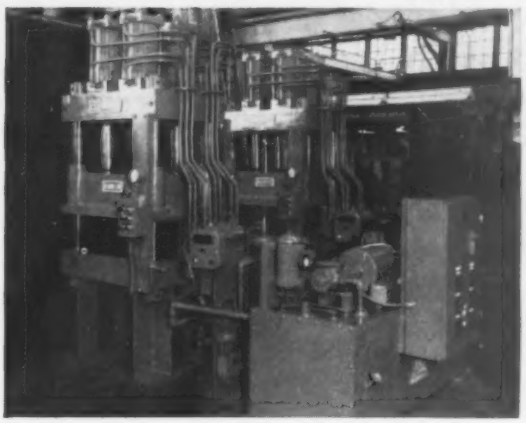
Randolph L. Ruhley
Vice President and
General Sales Manager
The Branford Co.
132 *Glen St.*
New Britain, Conn.

You name it—CLEARING will help you make it BETTER

with HYDRAULIC PRESSES like these...

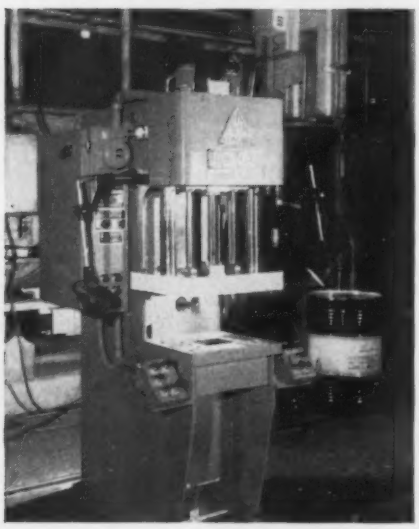
HEATING & AIR CONDITIONING PARTS—*FORMED*

Sheet metal parts are drawn on this 750 ton press designed to handle off-center loads with blank and draw dies using individually controlled cushions.



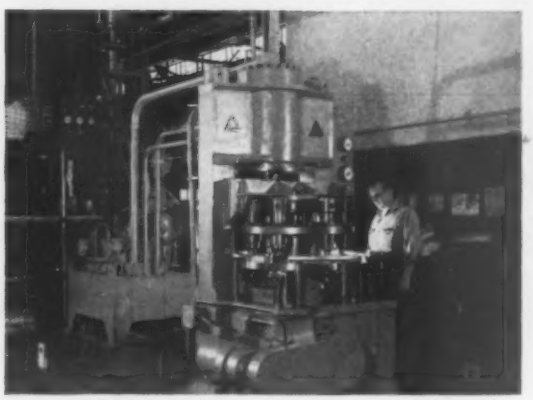
BOWLING BALLS—*MOLDING*

These two steam heated, 200 ton column-type hydraulic presses are designed for multiple cavity molding and operated from a single power source.



DIE CASTING—*TRIMMING*

High speed trimming is done on this 10 ton hydraulic gap press.



SOLID FUEL—*LAMINATED*

Three layer briquettes are made on this six station, 250 ton press operating at high speeds.

So...You name it...SEND YOUR PROBLEM TO CLEARING

We will build a Hydraulic Press that will solve your problem quickly, efficiently, economically.

Clearing, division of U. S. Industries, Inc., also manufactures the Clearing-Axelson line of engine lathes, power presses of all types, dies and special tooling, and special equipment for the aircraft and missiles industry.

USI Clearing DIVISION OF U. S. INDUSTRIES, INC. • 6499 W. 65th Street • Chicago 38, Illinois

Plants in: Chicago, Ill. • Hamilton, Ohio • Los Angeles, Calif.

Circle 606 on Page 53

Sterlings are built to take the SQUEEZE

EVEN A BIG SQUEEZE WON'T HURT

In the process of producing castings, modern molding machines exert unusually high pressures on foundry flasks. That's why foundrymen must be careful in selecting flasks that can really "take it on the chin" . . . and come back for more punishment.

Sterling Steel Flasks fill this need. They are designed and built to take such tremendous pressures, day after day, week after week, for YEARS. Fabricated from special hot rolled steel channel with controlled copper bearing and carbon content, they have strength where stress is greatest . . . solid rolled flanges . . . thick all-steel webs . . . and reinforcing ribs welded around each section to resist torsional strains. You get extra strength, with less weight for easier handling.

For complete foundry flask service . . . consult Sterling. Write for new catalog, just off the press.

Another shipment of Sterling Heavy Duty Steel Flasks for a prominent midwest grey iron foundry.

Sterling FLASKS

STERLING NATIONAL INDUSTRIES, Inc.
Founded 1904 as Sterling Wheelbarrow Co.
Milwaukee 14, Wisconsin, U. S. A.
Associate: STERLING FOUNDRY SPECIALTIES LTD.
LONDON • BEDFORD • JARROW-on-TYNE, England

A9-4533

Circle 607 on Page 53

WHEREVER METALS ARE CAST... FOUNDRY
JULY 1959

It's Everybody's Job

It's a fact that the foundry industry is making progress in promoting its product. Through effective association and individual company advertising, the availability of castings for an ever widening field of engineering and industrial applications is being presented to users and potential customers. Many foundries also offer beautifully prepared booklets which provide information on properties, applications, and production facilities.

In addition, through the Foundry Educational Foundation and the work of the trade and technical associations in the foundry field, young graduate engineers are leaving college with better information on the potentials of castings in the design of all types of machines and in many other products produced of metal.

All of this activity adds up to a good job in comparison with past efforts, but the fact remains that the industry has only scratched the surface in the promotion of castings.

What the industry really needs is an over-all effort dealing with all types of castings and employing every facet of promotion, including publication advertising, direct mail, and public relations. While concentrated on the promotion of industrial uses, it also could provide much pertinent data for newspaper editors, feature writers, and television and radio stations so that understanding would eliminate poor publicity, which is infrequent but irritating.

Such a program should be supported by all castings producers as well as by related industries supplying foundries with machines, materials, and services.

As one example, if money spent to entertain foundrymen at conventions, chapter meetings, and other gatherings were devoted to the promotion of castings, tremendous progress would be possible. It would seem that the time is past when foundrymen should expect such entertainment.

Applied to a general promotion program, funds from foundrymen and venders should help to increase the tonnage of castings purchased, should require a much greater volume of materials and supplies, and should increase the needs of foundries for equipment.

How can such a program be started?

Frank G. Steinebach
Editor

Circle 607 on Page 53

CHRYSLER'S NEW Aluminum Diecasting

A crash program of building preparation and equipment installation readied this plant for production in 64 days. Automatic transmission parts comprise most of the output from 41 diecasting machines

● PROGRAMS for equipping a diecasting plant and putting it into operation can assume whirlwind speed. The Chrysler Corp. diecasting plant at Kokomo, Ind., is a case in point. The first castings were made two months and five days after workers began readying the building for equipment installation.

Chrysler purchased the building in 1937 and produced manual automotive transmissions there until the spring of 1956. Then it stood empty until Jan. 29, 1957, when workers began preparing for the diecasting operation. Office workers moved in on Feb. 25, and the first equipment was installed on March 15. Pilot runs of castings began April 2, and production runs got under way on May 15.

Castings are produced on the first floor of the 150 x 500-ft, four-story building. Melting and laboratory operations are housed in an adjoining 62 x 154-ft, one-story building. The second floor of the main building contains most castings trimming, die repairing, and inspection operations. The parts crib and offices also are situated here. Available third and fourth floor area is used for the maintenance of a bank of castings. This permits leveling of casting production for efficient use of personnel and machines.

About 45 different parts are diecast in the plant. Most of these are housings and internal parts for automatic transmission assemblies. In addition, such engine accessory parts as timing chain case covers, fan spacers, oil pump covers, and distributor housings are produced. Production is on 41 machines, ranging in locking pressures from 400 to 1000 tons. Total employment at the plant is about 350 persons.

Monorail chain conveyors move most castings from casting machines on the first floor to second floor trimming areas. Certain castings which cannot be hung on carriers of the monorail are loaded in skid boxes for movement to the trim area.

Diecasting machines are arranged in East-West rows with holding furnaces back-to-back. This permits monorail hot metal carriers to enter from the East aisle, service the furnaces, and return on the same monorail section. Trucks, carrying boxes of castings or dies for the machines, enter aisles along the fronts of the machines from the West aisle. At no time is it necessary for trucks and metal carriers to cross paths.

Over-all lighting plus fluorescent fixtures at each diecasting machine and trim press provide good illumination. The die repair shop, laboratory and inspection room, the offices, and other areas also are well illuminated.

Roof fans with total exhaust capacity of 192,000 cfm provide gen-

Torque converter housing is removed from diecasting machine, background, to table for inspection before it is put on the conveyor at right to be carried to a trim press

Plant

By ROBERT H. HERRMANN
Associate Editor

eral ventilation. Fresh air intake units balance the exhaust, with the air heated in cold weather. Exhaust hoods are placed over the charging doors of both large melting furnaces, over the individual melting furnaces on diecasting machines, and above the doors of the two large holding furnaces. The four tilting furnaces also are vented.

Melting Operations—All secondary alloy A380 is used. Trucks deliver strapped bundles of ingots, weighing 1 ton, inside the plant where they are unloaded by fork truck and stored by suppliers' heat numbers. Analyses are run on all incoming metal. Scrap from the first floor trimming operation, as well as some additional scrap from the second floor trimming department, is stored in this area.

Scrap is weighed in front-dump buckets and moved by fork lift trucks to either of two 30,000-lb,

Fork truck with push-off device loads weighed stack of aluminum ingots onto cushion of scrap in a 30,000-lb reverberatory melting furnace

A 1-ton capacity metal carrier filled from the holding furnace hoists its load in preparation for delivery to smaller holding furnaces on the diecasting lines

Operator of the carrier fills a holding furnace at one of the aluminum diecasting machines

Worker inspects output shaft support casting, then hangs it on conveyor hook for transport to second floor trimming area

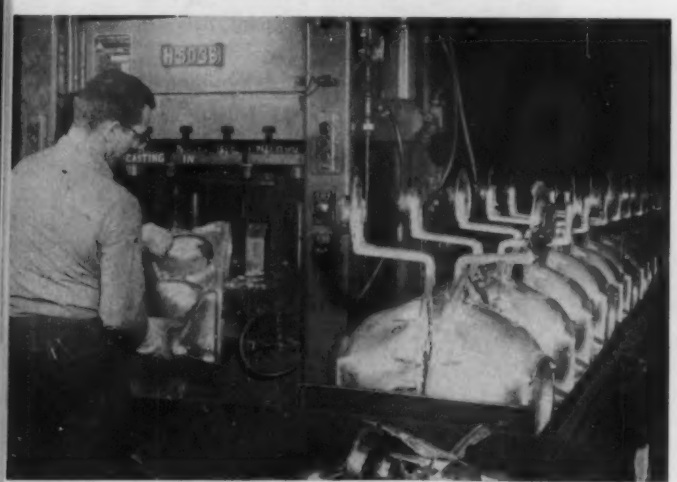
gas or oil-fired reverberatory melting furnaces. Fork trucks equipped with push-off devices load weighed stacks of ingots onto the cushion formed by the scrap. Charges consist of 65 per cent ingot and 35 per cent scrap.

Each of the melting furnaces is connected by a trough to its own 22,000-lb capacity, gas or oil-fired reverberatory holding furnace. Aluminum is tapped from the melting furnace at about 1400° F, leaving a heel of about 8000 lb to receive the new charge. As the metal flows into the holding furnace it passes through a small entry well where dross is trapped and hand-raked off to a skid box.

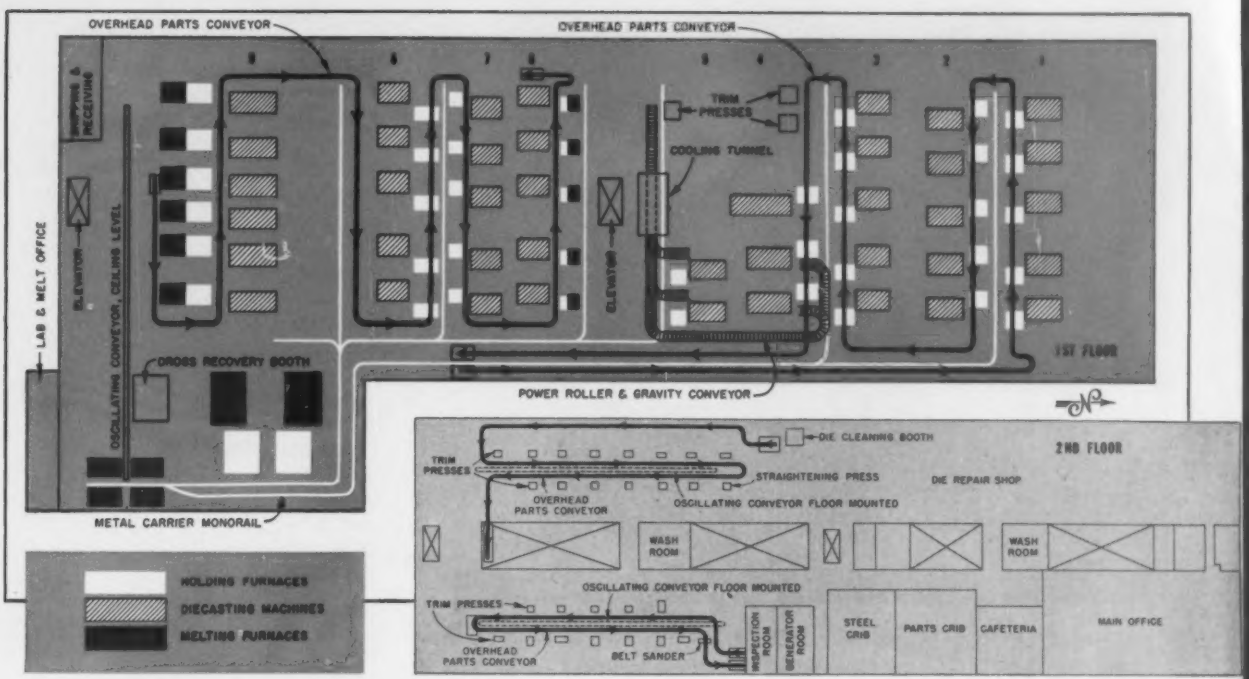
Dry exothermic flux is introduced onto the bath and stirred in with a rod. Dross is raked off to a skid box. Then the melt is degassed with chlorine introduced by a hand-manipulated carbon tube. Fluxing and degassing takes about an hour. After a sample of the melt is run through a quantometer for analysis, the furnace is ready for tapping into 1-ton capacity monorail metal carriers for delivery to holding furnaces at the diecasting machines on eight of the nine lines. Line 9 uses combination melting and holding furnaces.

Four gas or oil-fired tilting furnaces of 2500-lb capacity also are situated in the building housing melting operations. They are used exclusively to melt scrap from the second floor. An oscillating con-

Powered roller conveyor delivers torque converter housings to this 50-ton hydraulic trim press



Air jet ejects casting, center, from die to a skid box after the second of two trimming operations



Top view shows layout of machines, furnaces, and conveyors in first floor diecasting area. Lower view diagrams second floor castings trimming, service, and office areas

veyor mounted at ceiling level of the first floor carries scrap from chutes in the second floor to the center of a quadrangle formed by the four furnaces. An air-cylinder-operated diversion chute and gate directs flow of scrap to any of the furnaces. After fluxing and degassing, the metal is ready for trapping into the monorail carriers which run down the middle of the furnace quadrangle.

Castings Production—Nine lines of diecasting machines with locking pressures of 400, 450, 500, 600, 750, and 1000 tons produce castings ranging in weight from a few ounces to 15 lb as trimmed. Several types of holding furnaces serve these machines. Eleven are automatic ladling, electric resistance rod furnaces, seven having working bath capacities of 500 lb, four of 1000 lb. There are 19 induction furnaces. Eight are automatic ladling units with 500-lb working bath capacities; eleven are hand-ladling units with 800-lb capacities.

Lines 6 and 9 have 11 gas or oil-fired combination melting and holding furnaces. They are dry hearth units with melting capacities of 750 lb an hour and a 1000-lb holding bath. These are the original production lines and were in operation before the central melting department was finished. Today these furnaces provide a good safety factor to insure uninterrupted production when the central melting furnaces are overloaded. They also permit experimental work or production using different alloys. Metal is delivered directly to the holding furnaces from the central melting furnaces. Because the monorail metal carriers do not go to Line 9, it continues to melt its own metal.

Castings produced on Lines 6 to 9 are hung on hooks of a monorail chain conveyor and are carried upstairs to the West trimming area. A second chain conveyor carries castings from Lines 1, 2, and 3 up to the East trimming area.

Lines 4 and 5 produce torque converter housings. They are set on a combination gravity-power roller conveyor for movement through a short cooling tunnel to a 50-ton hydraulic trim press. The press operator places trimmed castings on a short chute, leading to a bench. Here a production inspector examines the casting visually. Then he stacks them into 4 x 9-ft wire boxes. A quality control man checks, on a sampling basis, the finishing castings in fixtures for dimensional accuracy and flatness. Approved box loads of castings are trucked to box cars for shipment to Chrysler's engine plant on Mound Rd. in Detroit. Other castings produced here are shipped to company plants in Indianapolis, Kokomo, Los Angeles, and Dayton, Ohio, for finish machining.

A central, recirculating system handles coolant water for all the casting machines. Pumps in the basement force water at 1500 gpm from an open storage tank through outside heat exchangers to the machines from which it flows back to the tank. Water temperature is maintained automatically at 90° F. Water is softened prior to introduction into the system and rust inhibitors are added periodically as required.

Trimming Operations — Most castings are trimmed on the second floor in either of two areas. Castings are brought to each by separate monorail chain conveyors which gather the castings from diecasting machine lines on the first floor. In each area the conveyor passes along one line of trim presses, then loops back along an-

Operator sets planet pinion carrier castings on dies of indexing table trim press. Castings are ejected on a chute to a skid box

other line. Press operators remove castings for trimming.

The two rows of trim presses comprising the East line include three 18-ton, six 30-ton, and two 60-ton mechanical units and one 30-ton hydraulic press. A table type belt sander also is available in this area. Mechanical trim presses in the West line include a 5-ton indexing machine, three 18-ton, four 30-ton, and one 60-ton units. Hydraulic trim presses include four 30-ton and one 50-ton units. In addition, an 8-ton press is used in casting straightening operations.

Oscillating conveyors are situated between the two rows of presses in each trim area. Air jets at most of the presses blow scrap off the dies to chutes leading to these conveyors. Castings are tossed to skid boxes. When numerous small castings are trimmed simultaneously on one press, the castings are blown off to chutes feeding skid boxes, and scrap is removed by hand. All presses are equipped with automatic die lubricating devices.

Castings requiring straightening are hand-worked on tables at some of the presses. Some of the larger cast parts are trimmed on the press available for that purpose.

The oscillating scrap conveyors discharge through floor openings to a common oscillating conveyor mounted at ceiling height on the first floor level. It supplies metal through the diversion chute to the four tilting furnaces described previously. An opening in the scrap conveyor just before the diversion chute permits removing scrap to skid boxes for movement to the large melting furnaces when it is needed.

Box loads of trimmed castings on the second floor are weighed, tagged, then taken down by elevator to the shipping area.

Repair and maintenance work and engineering changes on die segments, cores, and inserts are done in the die shop on the second floor. Very few complete diecasting dies are made here. Most dies are obtained from outside sources. On the other hand, most of the trimming dies and clamping and holding fixtures are made here. The shop is equipped with a milling machine with automatic follower, a true trace machine, and other mills, planers, lathes, grinders, and drilling machines.

Quality Control—The responsibility for raw material and castings quality is vested in a separate department. The plant metallurgist supervises checking of incoming metal, fire-resistant hydraulic fluid, and other materials used in the shop and reports the lab findings to the quality control manager.

Two main departmental groups control casting quality. One group is responsible for production line inspection. Checks are made for broken or bent cores, excessive flashing, and general appearance of castings. Certain critical castings are gaged dimensionally on the production floor.

Layout room people check special jobs for dimensions and porosity. Torque tests also may be performed. This group checks new die segments and inserts and sample castings from new dies for dimensions, appearance, and conformance to other specifications before the new parts are permitted to go into full production.

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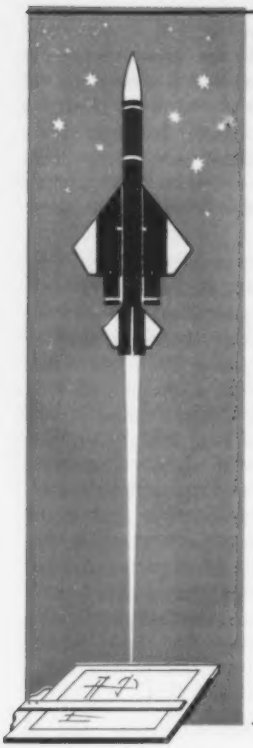
Quality control department inspector examines automatic transmission casting for dimensional accuracy



How To Sell More AIRCRAFT CASTINGS

A bigger market can result from better co-operation between designers and foundrymen and on new concepts concerning the ordering and supplying of cast parts

By LOWELL H. McCREERY
Technical Specialist
Tempco Aircraft Corp.
Garland, Tex.

● THE AUTHOR has a theory and a philosophy which defines and exposes one of the most important deterrents to widespread use of castings in the aircraft industry. This philosophy can be summed up in one word—Co-operation.

Before beginning the development of this philosophy, a definition of the term "aircraft industry" seems to me to be necessary. Most of us, when hearing the term, immediately envision an airplane of some sort and let it go at that.

This industry, however, is much more than an airplane industry. It embodies missiles both guided and ballistic, spacecraft both manned and unmanned, power plants from reciprocating engines through the various jet engines to nuclear power plants, and auxiliary equipment from the smallest micro-switch so small that one doesn't begin to fill a smoker's match box to actuating mechanisms taller than you or I and having many times the power any of us possess.

This is by no means a full definition of the industry but it does cover the major components of an extremely complex industrial giant. Now that our ball park has been defined, what about castings?

Design—The broad subject of design of castings needs no elaboration. There are many fully reliable and adequate references for design of castings. I would, however, like to emphasize the peculiarities of design for aircraft castings. In the first place, minimum weight is mandatory. This fact immediately gives aircraft castings a new appearance, for here it is inconceivable to use a generous factor to assure satisfactory service.

Use of such a factor would immediately rule out a casting due to excess weight. I don't mean to imply that no factor at all is applied, for military design specifications require some design factor for every structural part. This factor varies depending on the military service involved. The highest of these factors is 1.5, with the design based on and the factor applied to yield strength. In addition, military specifications usually require a casting to be designed using strength factors considerably less than demonstrated by cast test bars.

It is encouraging to note more designers using design strength based on properties developed in the casting. Depending on experience with castings and degree of control, aircraft manufacturers apply their own "casting factor." This factor may be 0 or may be as high as 2. The net result of this latter conservatism is very little usage of castings in our company's products.

In addition to the generally low design factor, the configuration of a casting used in aircraft usually is very complex. This results, I'm sorry to say, from the lack of confidence in castings which prevents their general usage. Castings in aircraft are usually specified only when there is no other way to produce the complex configuration and seldom when rational consideration alone indicates the selection of a casting. If castings were used more widely, the ratio of complex configurations would be reduced drastically and we would be unable to make the preceding generalization.

Added to the above factors is the need for extreme accuracy. This need stems from the necessity for controlling weight and secondly from the fact that all components

RECOMMENDATIONS—*To Foundrymen*

Improve your estimating procedures. Adopt the practice of shipping no casting unless you are at least 99 per cent confident it meets requirements and will be acceptable to your customer. Support the concept of providing a finished cast part by making certain you have the necessary production facilities. Sell that concept whenever you are asked to quote on an aircraft casting design.

of modern aircraft are held to very close dimensional and strength tolerances due to space and shape limitations.

So much for the peculiarities of aircraft casting design. There are probably others but these three do most to complicate the design of aircraft castings.

Inadequate Drawings—Engineering drawings are intended to convey the designer's brainchild to the foundry engineer. I'm sure that the problem of inadequate information conveyed by a drawing nowhere is more severe than with respect to castings. The reason is obvious when you give it some thought. Drawings for machined parts probably are no more adequate but they cause far less trouble. This is because the problems fall into uniform categories passed along from part to part over many years, and the problems of interpretation were solved so long ago that most experienced designers and machinists actually believe the drawing cannot be misunderstood. But just try giving a machined part drawing to a new man without any added instructions. Invariably he will produce scrap until, through trial and error, he arrives at the proper interpretation. Contrasted with this large experience backlog in dealing with machined parts is the problem with interpretation of casting drawings.

Almost without exception, every casting design is just enough different from other castings to set it apart as something new. Here the inadequacy of the engineering drawing takes on serious significance. Many castings are produced in facilities far removed from the designer. Questions similar to those concerning machined parts produced in the same facility as the designer's home area—questions normally resolved with a phone call or personal visit—go unasked by the foundry for many reasons, chief of which are the cost and difficulty in establishing details of the questions either in writing or by a phone call. As a consequence, mistakes or misinterpretations occur and much time and money are wasted.

Clear Specifications Needed—For these reasons casting designers must be particularly careful to specify clearly every conceivable detail of the part to be cast. Even so, misinterpretation frequently will occur. One approach to the problem is to specify minimum dimensions and maximum weight based on nominal expected dimensions, with dimensional tolerances specified only on those portions of the casting which mate with other parts and must be machined to close tolerances or used as cast. Another helpful approach is the use of target or development dimensions and tolerances, with the final dimension and tolerance placed on the drawing only after some experience with casting the part.

Preliminary discussion with the founder before the drawing is released is helpful but this doesn't always work in aircraft. Military procurement regulations require getting three bids, and the company selected to do the work frequently isn't the one which provided the assistance; and contrary to the opinion of some, all foundrymen do not agree on how to make a certain configuration or even what constitutes reasonable tolerances or quality levels.

One other problem which generally complicates the use of castings is the general practice of considering castings not as finished or semifinished parts, but as raw material. This is a fallacy of long standing and I'm convinced it will be with us a long time. But this doesn't make it right. Inspection practices for the two different categories vary drastically, and much more consideration is given to finished or semifinished parts. In general, it appears that inspection of finished or semifinished parts consists of looking for those factors which must be corrected before the part is put to use.

A Way Out—One way out of this dilemma seems to be shaping up. This concept says that since a casting usually must have some machine work applied to it before use, the purchaser and his designer really have little interest in the casting itself but confine their interest to the part produced from the casting. So why not purchase the finished part, not specifying whether surfaces, other than mating surfaces, are cast or machined?

This approach places the entire responsibility for producing an acceptable part squarely on the shoulders of the foundryman but —and this I feel is extremely important—it affords him all the latitude he needs to produce a part of

RECOMMENDATIONS—*To Designers*

Make the design drawing as clear as possible. Do not complicate the part any more than necessary. This costs money. Specify dimensional tolerances only on critical dimensions; use minimum dimension and maximum weight otherwise to control the part. Show material, heat treatment, and other processes clearly. Use standard radiographic defect reference charts to specify quality level. This gives foundrymen a real assist in estimating costs and production problems.

Do not specify perfection unless really needed, and this rarely is the case. I have yet to see perfect wrought material, although, through recent advances, wrought products are getting closer and closer to perfection. Support the concept of procuring a finished part and not a so-called raw casting.

sound quality with no restriction on as-cast thickness or manner in which excess metal is removed. It seems to me that it is long past the time for foundrymen and designers alike to bury the hatchet and meet on common ground. The above concept provides the means for doing just this.

For several years we have tried the co-operative approach—the designer trying to understand the foundry problems and the foundry engineer trying to understand the aircraft designer's problems. That this has not been successful is evidenced by the small numbers of castings used in aircraft designs. This being the case, it is time to try a new approach and the plan presented above seems to me to have more than a little merit. I don't mean to imply that co-operation is not necessary, but let's carry co-operation one step further and allow the foundryman even more flexibility. This I believe to be the key to extensive usage of castings in aircraft.

Use to Date—Generally speaking, development time has been so long and production experience so erratic that few castings are being used today in aircraft. As mentioned before, castings are specified only as a last resort. If castings were specified everywhere they should—and would be if their background in aircraft were more encouraging—their use would be much greater than it is today. My estimate, a conservative one, is that it would be somewhere around 500 to 1000 times as great.

What is the reason for this lack of confidence in castings? Long lead time and failure to deliver on schedule. This failure to deliver on time resulted from a lack of meeting of minds, a lack of proper interpretation of what the designer meant, and lack of appreciation of the production problems involved on the part of the foundry's estimator. Think what the foregoing recommendation could do for this situation.

It sounds rather hopeless doesn't it? Once production has been successful and castings have been tested against the design requirements, however, they have shown amazing performance and have given proof of the fact that a good casting is just as good as a part produced by any other means. Successful tests of aircraft castings have, however, been so infrequent as to have caused hardly a ripple in design thinking for aircraft.

RECOMMENDATIONS—*To Designers and Foundrymen*

Maintain an open mind. Remember, most people are opposed somewhat to radical changes. Automobiles still are made with stick shift transmissions for those who have not yet accepted automatic transmissions. Support the theme of this presentation. All of you should look upon this possible solution to a dilemma of long standing as worthy of your support. Consider it your patriotic duty to enlarge by many times the usage of castings in aircraft.

Why is it your patriotic duty? Because some way, somehow, the cost of aircraft must be reduced. Increased use of castings would not make much of a dent in the cost, but, like everything else, every little bit helps. Almost without exception, a shape produced by casting costs less than a shape produced by other means. The newer metals will provide an even greater chance for cost reduction through the use of castings.

A revolution is needed to make castings more acceptable to the aircraft designer, and the responsibility for causing it is shared by designer and foundry alike—the designer, to support the concept of procuring a finished part made from a casting; the foundry, to provide the facilities for meeting this new approach.

Future Problems—The future appears to hold nothing but problems. To meet the requirements of designs for hypersonic speeds, re-entry from space, and sustained high-altitude, high-speed flight will require materials much more difficult to process than those materials we have come to accept as commonplace—namely, aluminum, magnesium, and steel. It appears that refractory metals such as molybdenum, tungsten, and possibly tantalum and niobium, will play an important role in the craft of the future.

Without a doubt, pressure will be brought to bear on foundries to produce castings of these newer metals. It goes without saying that these metals will require new facilities. A year or so ago in talking to some steel founders, I predicted that the foundry of the future would consist of a clinically clean, atmosphere-controlled area in which castings would be produced using fantastic amounts of electric power for air-conditioning, melting, degassing, and atmosphere regulation and control.

I'm more convinced than ever that this prediction will become a reality. I would like to call your attention to the facility being provided at one of the steel companies for performing work on refractory metals. This facility will permit men in space suits to perform work in an atmosphere protective to the hot metal being worked but fatal to the workman without his space suit. It would seem that something very similar will be required for production of castings of these exotic materials.

With the new metals and new facilities must come new concepts and I present the concept of maximum flexibility for the foundry as being essential to the use of castings of these metals in aircraft.

In conclusion, remember that to increase the use of casting in aircraft, the designer and the foundryman alike must maintain an open mind and support any concept which appears to have a chance of dispelling the stalemate that exists today. The place for the evolution to start with respect to design is in the classroom. Designers must be convinced that good cast metal is completely reliable and dependable and only a long history of incomplete co-operation has given rise to a feeling of distrust of castings in critical applications.

Editor's Note: This article is based on a paper presented at the Foundry Educational Foundation's 12th Annual College-Industry Conference, Cleveland, March 18-19, 1959.

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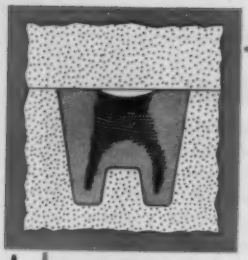
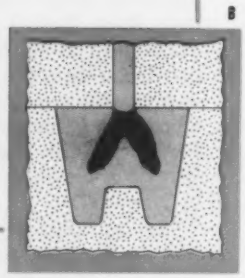


A

CASTING INTEGRITY

Casting integrity can be defined as that degree of soundness, strength, ductility, or other necessary properties which exactly meets service requirements

By CLYDE L. FREAR
Foundry Engineer
Alexandria, Va.



B

Fig. 1—In keel block test bar gated to main casting (gate into top of riser not indicated), vent in B permits atmosphere to enter and avoids shrinkage shown in A

● THE CORRECT choice of casting methods permits production of most casting designs with complete soundness. In addition, simple design changes which will not affect the use of the part in the final assembly can permit cost savings.

It is not, however, the purpose here to describe changes in design or foundry procedures which will result in complete soundness. This article will discuss casting integrity or soundness as a function of a casting's suitability for the purpose for which it was designed.

What It Means—First, it is necessary to define casting integrity as that degree of soundness, strength, ductility, or other necessary property which exactly meets the specific service requirements of the casting.

Such a definition means complete soundness in castings subjected to exceptionally high hydrostatic or mechanical pressures; less complete soundness for parts subjected to low pressures; and no special soundness for castings used only for their weight or shape.

Although specifications permitting a controlled amount of unsoundness in castings seldom have been written, in numerous instances a certain amount of porosity can be permitted in a casting and may even be of advantage.

A case in point is that of a phosphor bronze bearing. If it is sufficiently strong to withstand required mechanical pressures and sufficiently hard (and gummy) to withstand applied erosive influences, a certain amount of connected porosity within the body of the bearing absorbs lubricant and places it where it will be most effective when high pressures tend to squeeze it out or when the flow fails for a short period. In this instance, porous castings would have complete integrity, whereas completely sound ones would not.

It is difficult to state how this integrity can be measured, other than by requiring the highest obtainable quality without regard to any quality classification. This is probably the reason that, with a few notable exceptions, one seldom sees a specification covering any variations in casting quality.

Permissible Variations—It should be evident that a large range in the internal soundness of castings could be permitted. The author attempted to provide for such a range when he assembled radiographic standards[1] which form a part of every military specification for steel castings. In these standards, castings are divided into five classes:

Class I is for thin-walled, highly-stressed parts, the service for which permits of but few well scattered and rounded defects. Class V covers heavy structural castings, subjected to directional stresses, in which more and larger discontinuities may be permitted. Every specification covering castings should allow for such gradation of defects. The permissible gradation would have to be determined rather accurately for each job and then specified in the order.

The impossibility of writing a single specification to cover all gradations of quality for a specific type of metal and for all jobs is apparent. Therefore any specification necessarily would be qualified by other specifications, standards, plans, and contractual requirements.

These qualifications would have

to be stated with such clarity that misinterpretation by producer, inspector, or user would be practically impossible. They could not contain any statements which required individual or legal interpretation such as one included in nearly every present-day casting specification: "All castings shall be produced in a workmanlike manner."

Good Specifications—Producing a good specification involves more than a mere listing of the composition and the properties which the buyer thinks the metal may be capable of producing or which he desires in the castings he purchases. Successful specification writing requires a thorough knowledge of metallurgy, foundry procedures, design, strength of materials, and rhetoric. A little legal knowledge also would help. A really satisfactory specification requires writing, numerous consultations and revisions, and consideration from a legal standpoint.

It usually is necessary to specify certain compositional limits, but if limits are too close, the composition may be slightly off in at least one element. Although the castings would be perfectly suitable for the intended use, they must be rejected if the inspector has no leeway in accepting such slightly off heats. This procedure increases the cost, which is passed on to the customer.

As an example of unnecessarily close limits, maximum phosphorus content of gun metal and other tin bronzes is unduly restrictive. Adherence to the low limits sometimes actually lowers the quality of the castings. Phosphorus or other deoxidizing substances are necessary to remove excess oxygen added purposely during the melting operation to prevent the absorption of water vapor or hydrogen, for example.

The usually recommended 2 or 3 oz of phosphor copper per 100 lb of melt may be more than sufficient for the purpose. The excess alloys with the metal, raising the residual phosphorus above the specified limit, and there is a belief that excess phosphorus in a tin bronze causes excessive hardness or, more exactly, resistance to abrasion and crushing under applied loads.

Actually, the added hardness improves the machining properties of the metal because of somewhat improved chip breakage and a decrease in the flowability of the metal around the cutting tool. Certainly a small increase in residual phosphorus content materially increases the tendency to complete metallic soundness. Increased brittleness probably occurs and might increase the tendency to breakage. If the phosphorus is too low to deoxidize the melt, however, the lack of ductility due to porosity will be much greater than that caused by a slight excess of phosphorus.

On the other hand, certain amounts of some components in the alloy are necessary. A case in point is the minimum percentage of tin in bronze subjected to the attack of salt water flowing at high speeds. It has been found that a minimum of 6 per cent tin is required for such applications.

Buyer and designer should remember that every added requirement in any material purchased to specifications actually adds to the first cost of the part. The added first costs may result, however, in a considerable saving on final cost because of lower preparation costs and lower rejections. No hard and fast rule can be given on the economics of purchasing to specifications.

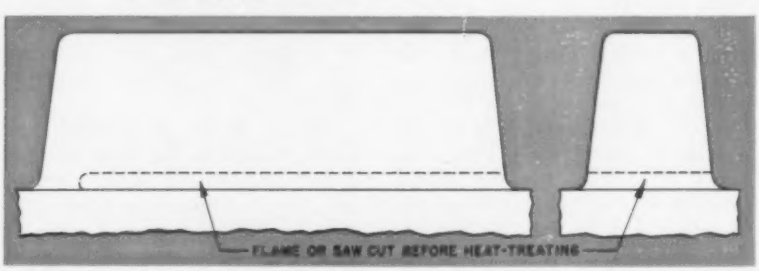
Test Bars and Castings—Higher physical properties than actually are necessary often are specified because it is almost impossible to correlate strength and ductility as shown by the usual tensile, bend, or impact tests with actual properties in the casting. In reality, the tensile test indicates the corresponding properties in the casting with certainty only when both are the same shape and size and were poured from the same heat of metal at the same temperature and at same speed and into the same molding material rammed to the same mold strength and hardness and having the same gating and risering.

Hence, a test bar indicating suitable properties tells only that the metal was capable of producing a sound casting if molding and pouring took advantage of its high quality. Obviously, poorly melted metal, as indicated by the properties of the test bar, cannot possibly produce castings of highest quality.

Naturally, design of the test bar and the method of gating and risering should provide the opportunity to obtain in the bar all the quality of which the metal is capable. Also, the test bar must not be cast in a section size in which "mass effect" will occur, with a resultant weakening effect on the metal. Test bars of tin bronze and aluminum alloys which have an inherent tendency to weakness in large sections therefore should be poured in small sections, usually as close to those which are the actual testing size as possible and which still permit cleanup in machining, if machining is necessary. Steel, manganese bronze, aluminum bronze, Monel, and the common brasses, which tend to solidify with a columnar structure and hence are less subject to the mass effect, may be poured in larger sections such as keel block castings.

Test bars for metals like the tin bronzes, which depend to a large extent on a chilled skin for their strength and pressure tightness, should be designed so that all surfaces of the test portion are in direct contact with the molding material and hence freeze and cool uniformly. This requirement would rule out the keel block casting for bronze or aluminum alloys and would eliminate the web in the Webbert bar commonly used for

Fig. 2—Cast-on test bar coupon shows the method of cutting prior to heat treatment



ounce metal composition.

Separately Cast Test Bars—Three general ways of producing castings from which test bars are to be machined include the following: 1. Separately cast. 2. Separately cast but gated to the castings which they represent. 3. Attached directly to the castings which they represent. Separately cast test bars are preferred since they can be molded to obtain directional solidification and hence are capable of indicating the exact quality of the metal. When castings are purchased to certain physical specifications, it may be required that a test bar be poured from the same ladle of metal for each casting.

Usually, one test bar is representative of all castings poured from that ladle, unless the pouring is sufficiently slow that a considerable temperature drop occurs in the metal in the ladle. In the latter event, it might be necessary to pour test bar castings at the start and end of pouring. If both bars show the specified properties, there is a fair certainty that all metal poured between is capable of making suitable castings, provided that all other variables are kept under strict control.

With large heats, when several taps are made from the furnace, it may be necessary to pour a test bar from each tap. Even if a large heat is poured from a single ladle, it may be advisable or required to pour three or more test bars at intervals during the pour to insure that the metal quality has remained under absolute control. The cost of one or more extra test bars is considerably less than that of one expensive casting which is scrapped because of unsuitable metal.

One difficulty should immediately come to mind. Pouring test bars at the time the castings are poured, then having the castings rejected because of inferior test bar properties is like locking the barn after the horse has been stolen. A better way would be to develop some method of determining properties and suitability of the metal while it is still in the furnace, when it may be possible to correct it or at least to keep it out of those castings which require high physicals.

Fracture Test Bar—The author,[2] among others, has described a fracture test bar as a partial answer to this problem. Although this test was designed to determine the presence of gas porosity and shrinkage in bronze, the author feels that a fracture test, correctly made and interpreted, is worth more than all the tensile tests which might be made after the castings have been poured. In this connection he is inclined to agree with Caine,[3] who has presented a number of original ideas on casting inspection and properties.

Manganese bronze propeller manufacturers use a bend test to determine the suitability of the metal while it is still in the furnace, where it can be corrected either by adding zinc or by continuing the heating until some of the zinc has been volatilized.

In this test, long bars with rectangular cross-sections are cast in open sand molds. Some of the bars are permitted to cool in the sand to a desired temperature, and some are water quenched. These bars are bent around an arbor of the desired diameter. From the angle of bend before breaking, the color of the fracture, and the grain size of the fractured surface, the melter can determine rather accurately the conditioning necessary to produce the required properties in the finished castings.

Steel castings do not offer too great a problem since it is possible in a few minutes to analyze a heat melted in an electric or open-hearth furnace. If necessary, it is usually possible to recondition the heat before it is poured. Another helpful thing about steel castings is the fact that they usually are heat treated. This treatment gives the castings a new set of properties and tends to homogenize the structure and produce more uniform properties throughout.

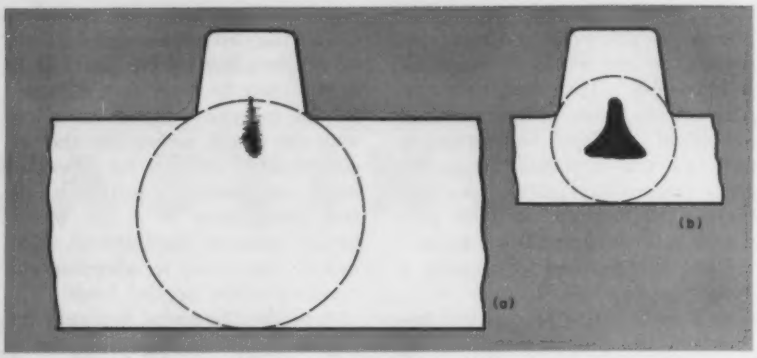


Fig. 3—In cast-on test bar coupon, high casting-to-coupon ratio in (a) causes low shrinkage. Low casting-to-coupon ratio in (b) causes high shrinkage

Steel test bars heat treated with the castings are somewhat more representative of the castings made from the same metal than those of metals which are used without heat treatment. The same can be said for certain aluminum alloys and other nonferrous alloys which are heat treated. What is needed is some method of determining the suitability of small bronze and aluminum heats while they are in the furnace.

In this discussion, no consideration has been given to gray iron, malleable iron, or ductile iron heats. Because of graphite formation in these metals, they are outside the scope of the present article.

Bars Gated to Castings — Test bars gated to castings are poured in the same mold as the castings they represent. They are cast more easily in the drag with the top of the riser at the parting line and gated to be poured from the downgates to the castings. They are supposed to represent the properties of the castings, but, as with separately cast bars, their properties do not necessarily bear any relationship to the casting. Furthermore, unless special care is taken in molding them, they will not even show the inherent properties of the metal.

Fig. 1 shows a standard keel block molded in the drag for easy gating into the top of the riser. So far, this is apparently good practice, for everything should make for completely directional solidification.

Consider, however, that such a casting is poured in a closed mold and that an impervious metal skin forms immediately and extends completely around the mold cavity. This skin shuts off atmospheric pressure to the riser and causes incomplete feeding. Shrinkage is almost certain, as shown in Fig. 1a, and the properties are lowered correspondingly. The only advantage of such an integrally gated test bar is that it can be identified as being from the same melt as the casting to which it is attached.

On the other hand, the test bar cannot actually indicate the properties of the casting since neither a sound casting nor the test bar can have uniform properties throughout. To be sound, a casting must have been fed completely through directional solidification, which requires suitable temperature differentials between different parts of the casting and risers. These temperature differentials result in larger grain size in the more slowly solidifying portions and hence in somewhat different physicals from those in the faster solidifying, finer grained areas.

Bars Attached to Castings—With heavy-section steel castings, test bar coupons often are cut with an acetylene flame or a saw until they remain attached to the castings by a short connecting web. After the castings have been heat treated, the bars are broken off, machined, and tested. Fig. 2 shows a typical integrally cast coupon.

It also is common practice to place such attached coupons on the surfaces of propeller blades and hubs at points where experience has determined that test bar values indicate properties of the casting. Although the test bar values will be approximately the same as those of the adjacent casting, they will not represent the properties at any thicker or thinner sections—and probably not the average properties even of the section itself.

There is one important disadvantage in using such cast-on coupons. Fig. 3 shows that any attached coupon causes an increase in casting thickness which cannot be fed except by a complicated system of risering which entirely defeats any slight advantage of the attached bar. The increased section results in a tendency to shrinkage.

That tendency increases as the comparative casting wall thickness decreases and decreases as the wall thickness increases, but will not disappear as long as the unfed coupon is present. Note that if any inscribed circle is larger than any other which can be drawn in the section in question, as indicated in the figures, shrinkage will be present somewhere within the area represented by this larger circle.

The following points sum up the physical properties as indicated by test bars and actual properties of the castings which they represent: 1. Test bars indicate only the ability of the metal to produce castings free from discontinuities. 2. Actual soundness and properties of castings depend on ability of the metal to solidify without discontinuities and efficacy of molding and pouring methods. 3. The test bar does not give a true measure of the strength of the casting. 4. No casting can have the same physical properties throughout, even though it may be completely sound.

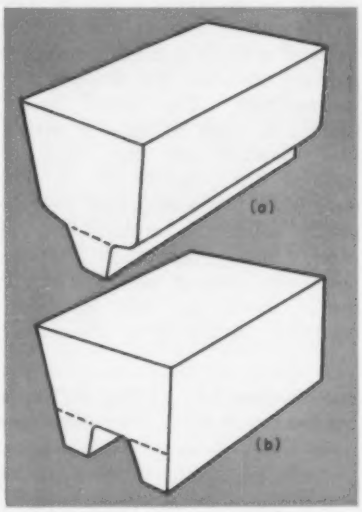


Fig. 4—Standard keel block test bar castings—single (a) and double (b)

What To Do?—How then can we determine whether a casting has the necessary physical properties? It probably is true that no casting requires the same strength throughout its parts and sections. It also is true that most castings do not have and do not need the strength specified for the test bar.

A casting must be designed so that completely directional solidification can be obtained throughout all its parts. Also, the gating must set up the desired temperature differentials in the mold. Heavy sections which feed light sections must not be so large as to introduce weakness due to mass effect. Since the latter varies with different metals, the special characteristics of each metal must be known to the designer.

In most castings, high physicals are necessary only in certain areas, but some means must be available to determine that these areas really do have the physicals required. The simplest method of determining the true physicals throughout any casting would be to cut the casting up into test bars which would indicate properties of the particular areas from which they were removed. But would that method really show the actual properties?

The fact is that a test bar cut from the casting will not indicate the true physicals at the particular location from which it was taken. The cross section of any casting is made up of at least three layers, which vary considerably in their physical properties. In addition, the properties vary within the individual layers, being highest nearest the surface. On the surfaces, the usual chilled skins have the best properties. Beneath these chilled skins are one or two layers of columnar grains with good strength, but not as high as that of the surface. If the section is large, there may be a central equiaxed area having low strength and low ductility and containing most of any shrinkage which is present.

Even the test bar itself, cast under the most nearly ideal conditions, is made up of these layers, and the physicals determined from it are only the average properties of its whole cross-sectional area. When a bar is cut from the casting, it is probable that all the strong, ductile, chilled skin will be machined away, leaving only the weaker columnar grains and perhaps only the equiaxed grains plus most of the shrinkage. The result is that such a bar will show properties considerably lower than the average properties of the casting wall. Fortunately, we will be far on the safe side, but this procedure is like walking a mile to make certain of having traversed a single city block.

There are ways to measure actual stresses at any or all points in a casting. Perhaps the simplest method, applicable only to pressure vessels, is by the hydrostatic test, in which any desired pressure, up to that causing bursting, can be applied safely. Ordinarily this test is used only to determine leakage or, we hope, absence of leakage.

By the use of trammel points and careful measurements, however, it is possible to determine the actual strains which result from the applied pressure. A more accurate method is by the use of strain gages attached to all critical areas on the casting. This approach permits accurate determination of all elastic and plastic deformation under stresses caused by the particular type of loading.

This discussion has been limited almost entirely to the properties of castings and to the use of the tensile test bar to indicate these properties. The author agrees with Caine[3] that the tensile test has proved to be lacking in that its results cannot be interpreted in relation to the stresses and loadings which cause the greatest number of failures in stressed materials and components. Therefore, other types of tests must be developed at the earliest opportunity. Until the new tests are developed, however, we should determine how to produce good tensile test bars.

Keel Blocks—The simplest test bar casting in point of molding cost probably is also the best design for those metals which solidify with a completely columnar structure. This is the so-called keel block casting. Fig. 4a shows a single coupon block which can be made long enough to provide for two standard threaded test bars. The double coupon block, Fig. 4b, can be made shorter, still provides two test bars, and is somewhat more economical of metal.

These designs provide completely directional solidification. They should be top poured slowly in open molds without runners, and it would be well to apply insulating covers to prevent the risers from freezing over prematurely. The actual "keels" should be high enough to provide the standard test bars plus an amount which can be cut off. The keel block is recommended for normally solidifying metals such as steel, brass, manganese bronze, aluminum bronze, and Monel. It never should be used for "skin-sensitive" metals or for those tending to solidify by rapid dendritic growth, as the tin bronzes do.

Fig. 5 illustrates two test bar castings developed for the tin bronzes, including ounce metal, which solidifies like them. That shown in Fig. 5a is believed to be the oldest standard test bar casting design for these metals. It now is used for ounce metal and to a lesser extent for hydraulic bronze.

This bar was found to be inadequate for the bronzes with higher tin contents, and the design was altered to that shown in Fig. 5b. This design is somewhat better than that of the previous bar in that the web has been increased to $\frac{5}{8}$ in. or the same thickness as the diameter of the reduced section of the coupon. The web also has been eliminated in the reduced section, permitting the formation of the chilled skin completely around the portion of the bar to be tested. Although the $\frac{5}{8}$-in. web might be expected to feed the reduced portion of the coupon, it certainly could not feed the 1-in. portions. Shrinkage in the ends almost certainly would extend into the reduced middle section.

Some years ago the Washington Naval Shipyard (Naval Gun Fac-

Fig. 5—Test bar castings for tin bronzes. Webbed bar for ounce metal is (a) and bar for tin bronzes is (b)

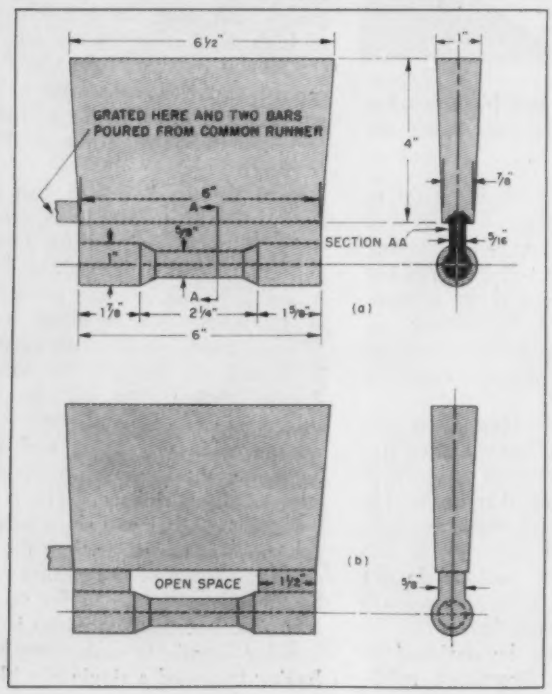
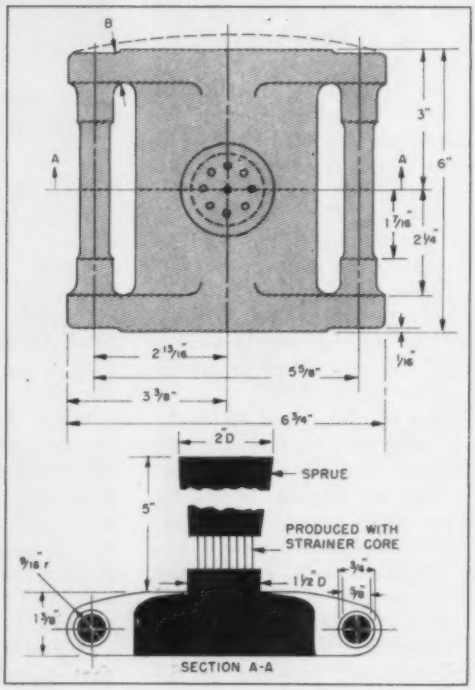


Fig. 6—Test bar casting for tin bronzes. New design was developed by the Naval Gun Factory



tory) realized the shortcomings of the test bars available for bronze and developed a new design of casting. It eliminated most of the failings of the old design and made the casting easier and more economical to mold. This design is illustrated in Fig. 6. Note that the web has been eliminated entirely. Feeding of the reduced section of the coupon is through the two enlarged end portions. They in turn are fed by a well designed and proportioned riser.

Two possible changes in this design would help to provide soundness and the highest possible properties in the test bar. Dimension B as presently designed appears to be slightly less than the diameter of the end portion of the coupon and hence will not insure complete feeding past this point. The reduced sections of the coupons are smaller than the dimension in question, but the reduced sections cannot be fed completely unless the enlarged end portions also are fed completely. For added insurance at an almost negligible cost in extra metal and no added cost in molding, the author suggests increasing the thickness at each end approximately as indicated by the dash-line shown at the top of the figure.

The other change concerns the use of the strainer core in the sprue and riser. A thick strainer core at the point indicated will reduce the over-all area of the riser and put the highest feeding point at the bottom of the core. The result is that all metal above the top of the strainer core will be wasted. If the core and the mold are permeable to air and all the corners around the bottoms of the holes are left completely sharp, the William's principle will be effective and permit a breakthrough of atmospheric pressure, thus providing complete feeding. Otherwise, it is difficult to see how the strainer core serves any useful purpose; it may even be a disadvantage.

Fig. 7 shows the standard test bar for aluminum alloys. This bar is intended to be broken without previous machining. For this reason it should indicate the average tensile properties of the whole bar, as qualified by possible lowering of the properties because of the notch effect resulting from roughness caused by the molding material. The casting can be molded in a plain cope and drag flask and the test bar coupons are fed directly by hot risers placed at the ends of the enlarged grip portions. Hence feeding should be complete.

Of course, this complete feeding is obtained only if the risers are kept open to the atmosphere and feeding is not cut off by the freezing over of their surfaces. The only thing left to worry about is the well known fact that molten aluminum and its alloys always carry a film of aluminum oxide on the surface. If the metal is cool when poured into the sprue, the film can prevent complete knitting of the metal in the middle portion of the reduced section, where the two streams come together.

Quality Requirements—For purposes of economy, castings should be specified of a quality no greater than that actually required to withstand the stresses to which they will be subjected in service, allowing for a factor of safety to cover errors in design calculations and for those accidental variations which are bound to creep in occasionally during manufacture. With greater care in calculations resulting from the engineer's increased knowledge of the real properties of castings, and the foundryman's knowing how to control the quality of his product, those errors and variations can be cut so much that only slight allowance must be made for them. Under these circumstances, castings can be ordered to graduated performance standards.

Before this can be done, however, it is necessary to set up rather accurately defined classes of castings. Procedures for making them must be standardized to such an extent that the foundry can supply castings with the exact quality, uniformity, and strength desired. Today there is little or no classification with regard to performance requirements. The usual procedure is to use the same specification for all castings of a particular metal, paying the price, either directly or indirectly, for castings capable of carrying the heaviest loads even though they may be subjected to only the smallest service stresses.

Such a classification is difficult and will take time to effect. The following is a preliminary and admittedly incomplete classification:

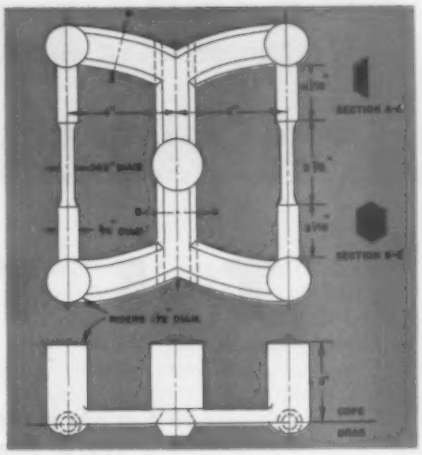


Fig. 7—Test bar for aluminum alloys

Class	Service
1	Very high internal pressures
2	Very high mechanical pressures or loadings
3	Medium pressures, mechanical or fluid
4	Low pressures, mechanical or fluid
5	Castings purchased only for their weight or bulk

Once such classifications have been developed, it will be necessary to develop inspection methods which will show the foundry and the buyer at a reasonable cost that the product is exactly what was ordered. Beyond these details, there are two additional difficulties.

The first is that some buyer will order a classification higher than is actually required for the purpose and will pay an excessive amount for the castings.

The second is that buyers who are too cost conscious might buy at the lowest price, for which they could get only castings of a classification lower than that actually specified.

The buyer would have to pay for quality, but he could effect considerable savings by purchasing castings of a lower classification when such castings were perfectly satisfactory for the intended service.

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3. J. B. Caine, "The Case Against the Tension Test," FOUNDRY, Vol. 86, No. 9, September, 1958.

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Vacuum Arc Melting and Casting of . . .

TITANIUM

This article is the second and concluding portion of a report on results of a Naval Research Laboratory investigation of the feasibility of vacuum arc melting and casting of titanium

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● GENERALLY it is difficult to cast thick plates without developing considerable gross unsoundness due to shrinkage during solidification. To explore the casting behavior of titanium involving severe shrinkage conditions, several plates, 24 x 24 in. and from 0.5 to 1 in. thick were cast in graphite molds.

A plate mold, Fig. 11, was constructed of 1-in. thick National Carbon Co. Grade ATJ graphite. The use of various sized spacers in the mold regulated the thickness of the cast plate section. All of the plates were cast vertically and fed from a side gate opening off a 2.5-in.-diam riser.

Ultrasonic and radiographic inspection of the plates showed considerable randomly distributed shrinkage unsoundness concentrated along the central plane of the plates. It took the form of porosity ranging from pinholes to about ¼-in. in diam. The larger pores were spaced from 2 to 2.5 in. apart.

An attempt was made to decrease turbulence during pouring by placing a graphite baffle, shown in Fig. 12, in the feeder riser to direct the flow of molten metal to the bottom and out through the side gate. Some reduction of shrinkage porosity resulted from this arrangement, radiographic examination showed, but the amount removed was insufficient.

Since graphite exhibits good thermal conductivity and a high specific heat, rapid heat extraction may be expected from metal cast against it. In unheated graphite molds, castings freeze rapidly from the surface inward, complicating the shrinkage problem.

In addition to the ingot and plate castings made to study shrinkage, step castings were prepared in several positions and gated at either end. The graphite mold for these castings, Fig. 13, measured 3 by 12.5 in. long with 0.5, 1, 1.5, 2, and 3-in. thick sections arranged in stepwise order. Vertical castings were made with large and small ends

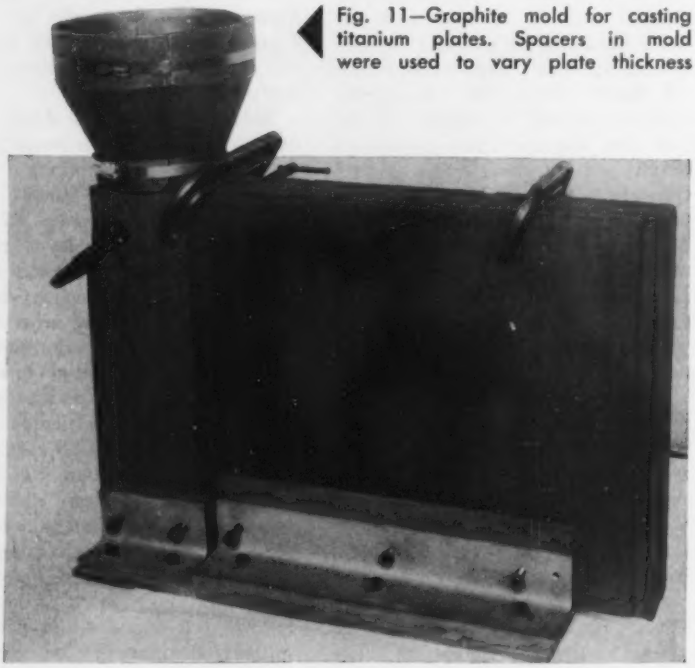


Fig. 11—Graphite mold for casting titanium plates. Spacers in mold were used to vary plate thickness

up, and horizontal castings were fed from the light and heavy ends. A typical step casting is shown in Fig. 14.

Radiographs of equidensity were made of these castings by immersing the casting in a 70 per cent zinc bromide solution during x-ray exposure to obtain better resolution of defects. Severe shrinkage was noted in all sections except one cast vertically with the large end up. In it, shrinkage was confined to the top section, which acted as a riser for sections below it.

When titanium is cast from a lip-poured crucible, the hottest metal is the first to leave the crucible. Thus a nonuniform temperature exists in the molten pool, even with rapid handling to avoid loss of superheat. NRL skull furnace practice requires about four seconds from the time the arc is terminated until the last of the metal empties out of the crucible.

Casting of titanium thus is complicated by such factors as nonuniform temperature of the molten pool; rapid cooling of the metal once the arc has been terminated; and rapid cooling of the cast metal by the graphite mold. These variations make it difficult to predict flow and solidification properties in different sections of the mold. Rapid pouring rates cause turbulence, and larger than normal sprues, gates, and risers are necessary to accommodate the flow.

Surface Contamination—To study the surface reactions between molten titanium and graphite or graphite coated with various compounds that may act as inhibitors, a graphite mold was designed in which four cylinders 3 in. in diam by 6 in. high could be cast simultaneously. Provision was made for inserting split cylindrical liners into the mold cavities so that base conditions could be duplicated many times. A typical mold setup and casting are shown in Fig. 15.

In the study of surface contamination of titanium cast in unheated graphite grades ATJ and AUC, samples were machined at 0.010-in. depth increments from the surface of both 6-in. diam ingot material and of 3-in. diam cylinders. The analytical results for carbon are shown in Table I.

Carbon contamination of high-purity, unalloyed titanium cast in graphite molds under vacuum appears to be localized mainly in the first 10 mils from the surface, with the carbon-rich layer about 5 mils deep. Metallographic examination of corner sections of ingots 6 in. in diam occasionally showed titanium carbide particles penetrating along grain boundaries to about 10 mils. No carbides were observed in microsections cut from cylinders 3 in. in diam. This result indicates that heavier titanium sections developed greater surface reaction with the graphite.

TABLE I—SURFACE PENETRATION OF CARBON INTO CAST TITANIUM

Distance from Surface	Percent C in 6" section	Percent C in 3" section
.005	.039	.037
.005-.010	.023	.030
.010-.020	.025	.030
.020-.030	.025	.030
.030-.040	.017	.025
.040-.050	.015	.017
.050-.060	.019	.017

Microhardness traverses of cast titanium with a base hardness of about 120 Bhn or lower have been ineffective in detecting carbon penetration with depth. Results were not consistent because of the anisotropic nature of the material.

Temperature Measurements—Direct temperature measurements of molten titanium in an arc furnace are difficult. The intense light emitted by the high-current electric arc and reflected from the surface of the melt eliminates the use of an optical pyrometer during melting. With a pouring time of 3-to-4 seconds for a 70-lb melt, an instrument of fast response is required to measure the temperature of the molten metal stream rapidly.

High-Speed Radiation Pyrometer—A high-speed radiation pyrometer with a response time of 0.6 seconds was used for this purpose. Output from the pyrometer was measured first on a potentiometer recorder and later on a recording oscillograph. Temperature differences between some of the first, hottest metal to leave the crucible and the last, at the solidification point, were determined.

The radiation pyrometer was calibrated against an optical pyrometer to above 1800° C. A graphite cylinder with a $1\frac{1}{2}$-in. hole 8 in. deep was heated inductively to provide a black body heat source. The sight glass window from the vacuum furnace and a spatter shield were inserted between the heat source and instrument to determine the ratio of transmitted to absorbed radia-

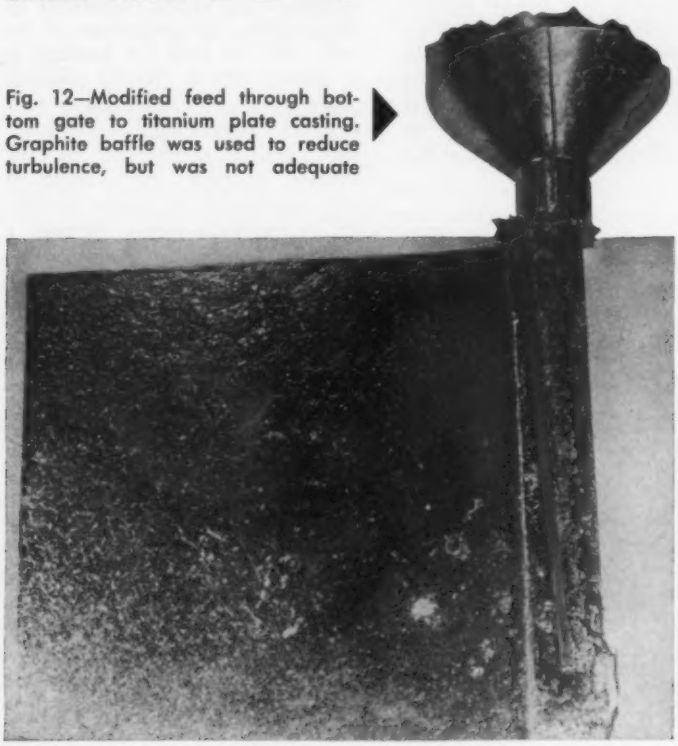


Fig. 12—Modified feed through bottom gate to titanium plate casting. Graphite baffle was used to reduce turbulence, but was not adequate

tion at 1600 to 1800° C. Only one-third of the radiation was transmitted through the two pieces of clean glass.

A thin film of titanium was deposited on the glass shield as a vacuum coating, particularly during the pouring cycle. Thus it was necessary to recalibrate and make corrections for the further decrease in transmitted radiation. An emissitivity value of 0.35 was used for titanium at 1800° C in all our calculations.[7]

The temperature difference represented by the maximum millivolt reading on the chart and the plateau representing the freezing point of a cooling curve gave the degree of superheat. For several 80-lb melts finished at 8400 amp, the superheat was 225 to 250° C, but values up to twice this amount have been measured.

Tungsten - Graphite Thermocouples—The chemical reactivity of molten titanium precludes the use of standard thermocuples to measure temperatures of liquid metal during casting. Titanium can be cast into cold graphite molds with a minimum of contamination, however, and a satisfactory high temperature thermocouple system can be established between graphite and tungsten. This system was selected for development of a technique for temperature measurement of titanium during casting.

The thermocouple system is composed primarily of a 0.020-in. diam tungsten wire centrally located in a 0.180-in. OD graphite tube and clamped mechanically to the graphite at one end by a threaded graphite plug. Electrical insulation of the tungsten from the graphite is obtained with a high-purity, recrystallized alumina tube.

This thermocouple system develops a thermal Emf output of 2.17 mv per 100° C in the temperature range from 1500 to 1700° C as calibrated against a platinum-platinum, 10 per cent rhodium thermocouple of known accuracy. Thermal arrests in titanium cooling curves occurred at 38 to 38.5 mv for the tungsten-graphite 'couple. This result indicated the freezing point to be 1700 to 1720° C for the titanium used.

The penetration of liquid titanium into graphite has been investigated and reported[8] to be related directly to the degree of porosity in the graphite, the temperature of the melt, and the time the graphite is in contact with it. Liquid titanium penetrates and impregnates the graphite thermocouple tube readily, causing destruction of the thermal junction. An example of this penetration is shown in Fig. 16. It shows a section through a tungsten - graphite thermocouple which had been placed in a 1½-in. gate or runner to a 20-lb titanium casting.

The 3/16-in. diam thermocouple was placed inside a ¼-in. OD protection tube of graphite. Within two seconds the liquid titanium

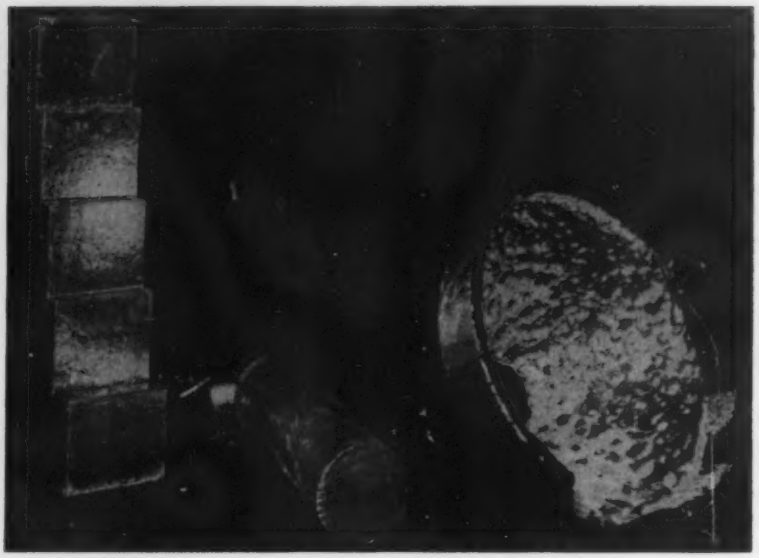


Fig. 14—Typical step casting made in mold shown in Fig. 13. Step castings were poured both vertically and horizontally and from either end

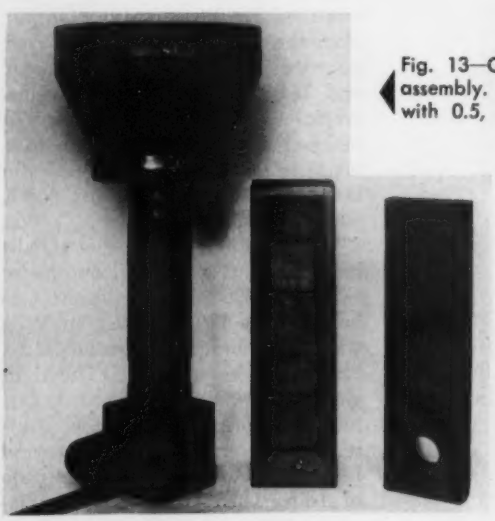


Fig. 13—Graphite step casting mold assembly. Mold is 3 x 12.5 in. long with 0.5, 1, 1.5, 2, and 3-in. steps

TABLE II—ANALYTICAL DATA

Ingot Number	Chemical Analysis				As-Cast Hardness
	O*	H*	N	C	VHN_{50Kg}
[E87(vibrated) E92(non-vibrated)]	.08	.0010	.005	.006	123
C83	.19	.0009	.009	.01	190
C89	.214	.0005	.008	.004	228
C90	.174	.0012	.017	.006	202

*By vacuum fusion

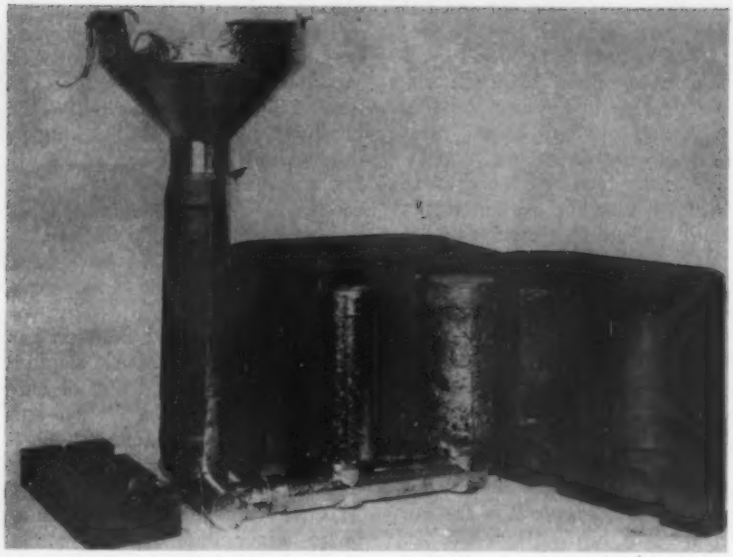


Fig. 15—A typical mold assembly for the study of surface contamination

penetrated the assembly as shown, filling and outlining the threads of a 3-48 graphite screw plug and completely surrounding the tungsten bead junction. The maximum temperature indication measured with this configuration of the thermocouple corresponded to 1780° C, and this temperature was reached within a fraction of a second after pouring.

Corrections were not made for the thermal flux, thermal conductivities, and specific heats of the materials involved, all of which would be necessary before an absolute temperature could be obtained from this measurement. At the present state of development, this thermocouple may be used for comparative measurements of melts of similar size or for multiple points within a single melt.

To prevent rapid destruction of this thermocouple in liquid titanium, additional protection is needed. One approach may be to use a more impervious graphite. Another may be to increase section thickness of the protection tube, but increased thickness would lower the response time and produce an undesirable lag in heat transfer to the 'couple. Development work on this thermocouple system is continuing.

Mechanical Properties of Titanium—To determine the mechanical properties of as-cast material and compare them with those of similar material in wrought and annealed forms, five rectangular ingots cast in the 4 x 7 x 14-in. billet mold were sectioned. A ½-in. thick plate was taken from the middle of each ingot for impact and tensile test specimens in the as-cast condition. One half of each billet was hot forged to a 1-in. plate at 750 to 875° C, and these plates were hot rolled at 816° C to ½-in. thickness.

Tensile specimens 4 in. long were cut from the plate in the transverse direction, and impact specimens were taken longitudinally to the rolling direction, with the V-notch cut perpendicular to the rolling direction. After machining, half of the hot rolled test specimens were high-vacuum annealed for one hour at 816° C and furnace cooled.

A set of specimens also was taken from a high-purity ingot in the as-cast, nonvibrated condition for comparison with an ingot of similar composition which had been subjected to 120-cycle vibration as previously described. The interstitial elements contained in these samples are listed in Table II. Iron and manganese, in the order of 0.08 to 0.10 per cent, respectively, are the only other major impurities in the titanium.

Tensile data at room temperature and the energy absorption of standard-sized, Charpy V-notch impact bars at three temperatures are summarized in Table III. The tensile data were taken from ⅜-in. diam bars with 2-in. gage length.

The Charpy impact data are presented graphically in Fig. 17. All showed a gradual decrease in notch toughness with decreasing temperature. Of particular interest are the relatively high impact values for the as-cast, large-grained materials. This result may in part be attributed to the low residual hydrogen content in the titanium attained by the vacuum melting and casting.

For the as-cast, high-purity, low-interstitial content titanium, exceptional toughness was indicated even down to liquid nitrogen temperatures. Hot working of this material at 816° C (1500° F) resulted in further improvement in toughness. For titanium containing more interstitial impurities, the toughness of as-cast, large-grained material was somewhat better than that hot worked at 1500° F. This behavior seems to be contrary to that generally expected from hot

TABLE III—MECHANICAL PROPERTIES

	Charpy Impact Tests			Tensile Tests			
As Cast	28°C	−40°C	−196°C	Ultimate Tensile PSI	.2% Yield PSI	% Elong. 2" Gage	% Redn in Area
E87 (vibrated)	155	138	123	46.7	27.8	34	60
E92 (non-vibrated)	161	150	131	45.6	29.1	31	50
C83	54	43	22	66.2	53.0	10	30
C89	66	52	24	64	51	9	35
C90	62	55	28	62	48.5	11	25
Hot Rolled, 50%, 816° C							
E87	179	179	172	56.8	47.8	26	90
C83	37	32	20	87.9	78.0	19	80
C89	38	34	23	84.4	72.9	20	80
C90	43	39	33	82.0	71.9	21	80
Hot rolled, vacuum annealed, 816° C							
E87				47.5	37.2	26	80
C83				81.0	70.0	25	45
C89				81.8	69.1	21	40
C90				78.8	67.6	20	45

working, but the reason for this trend was not investigated.

The use of low-frequency vibrational energy during solidification had little effect on mechanical properties of as-cast, high-purity titanium, but the limited data indicated a slight decrease in toughness for vibrated material (E87, E92).

A comparison of the tensile properties listed in Table III shows that vibration during solidification of the low-interstitial titanium slightly lowers the yield strength and raises the ultimate strength and elongation. Tensile strengths and ductilities of the as-cast titanium are lower than those of the hot-worked and the annealed counterparts. Unidirectional rolling of forged titanium develops higher strengths in the direction perpendicular to the plane of rolling.

This effect is evident from the elliptical cross section of the neck-down area in the hot-rolled tensile specimens and also is detectable in the annealed specimens. It is apparent that higher temperature and longer time are required for a complete stress-relief anneal.

Refining of the grain size of the as-cast titanium by forging and hot rolling increased the tensile ductility and reduction in area for all samples except E87. Here the tensile elongation apparently was decreased, and the large-sized grains gave rise to neckdown at several locations in the gage length and made accurate elongation measurements difficult. These large grains in the as-cast material caused nonuniform plastic deformation during the tensile test. As a result, the reduction in area values have little significance.

Summary — It has been demonstrated that titanium can be melted and cast under direct vacuum conditions at a pressure of about 0.1 micron without the use of inert gas for arc stability. A stable arc can be ignited at below 0.005 micron.

Relatively large volumes of molten titanium were developed, handled and cast without contamination. Improved vacuum conditions resulted in the reduction of residual gas content to a low level. Residual hydrogen was reduced to about 10 parts per million in cast titanium. A significant improvement in the melting efficiency and yield of metal cast also was attributed to the use of higher vacuum.

The use of a direct current watt-hour meter simplifies and makes possible accurate estimation of the quantity of molten titanium available in a given melt for casting.

The skull melting process permits development of a wide range of superheat which imparts a high degree of fluidity to titanium. This fluidity permits the chill casting of thin sections and of shapes requiring accurate reproduction of fine detail. Heavy sections such as homogeneous ingots up to 6 in. in diam, weighing 80 lbs, have been cast successfully, free from gross defects.

Vacuum arc melted titanium has been cast into machined graphite molds with limited depth of surface contamination by carbon and with a shallow and narrow diffusion gradient in such relatively thick sections as 6-in. diam ingots. The quality of the ambient atmosphere under high vacuum conditions may be important in holding carbon contamination to a low level in titanium cast in graphite molds.

The study of graphitic base mold materials is being continued on a limited scale to explore the possibilities of improving impermeability and inhibiting surface reactions.

Some progress has been made in the development of a thermocouple system for measuring liquid titanium temperatures. A preliminary study has been made indicating the feasibility of the tungsten-graphite thermocouple. Additional work is necessary to protect this thermocouple against penetration and destruction by molten titanium.

The limited mechanical property study made on arc-melted titanium cast under high vacuum indicated that the metal has exceptional toughness in spite of the large grain size in the as-cast material. Excellent impact resistance was obtained in tests at liquid nitrogen temperatures. Although mechanical properties and ductility of hot-worked, vacuum arc cast titanium are significantly more favorable than those of the metal in the as-cast condition, the as-cast metal appears to have adequate strength to warrant serious consideration of using its potentialities in the form of castings.

Acknowledgment — The support of the work on titanium casting by Code 637, USN Bureau of Ships, T. J. Griffin, is acknowledged by the authors.

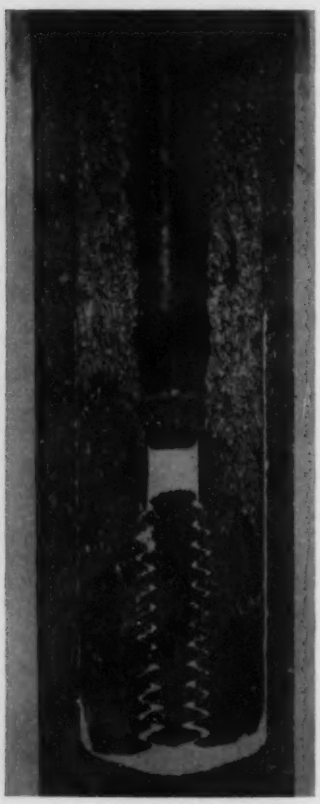
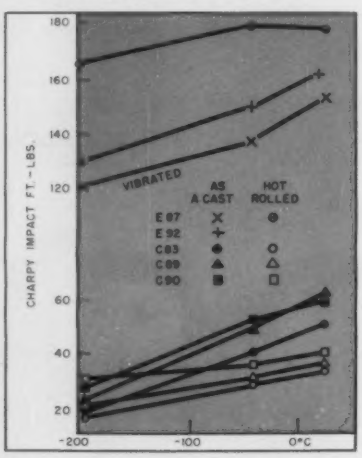


Fig. 16—Example of penetration of titanium into a graphite-tungsten thermocouple assembly. X 6.5

Fig. 17—Graphic presentation of the Charpy impact data in Table III



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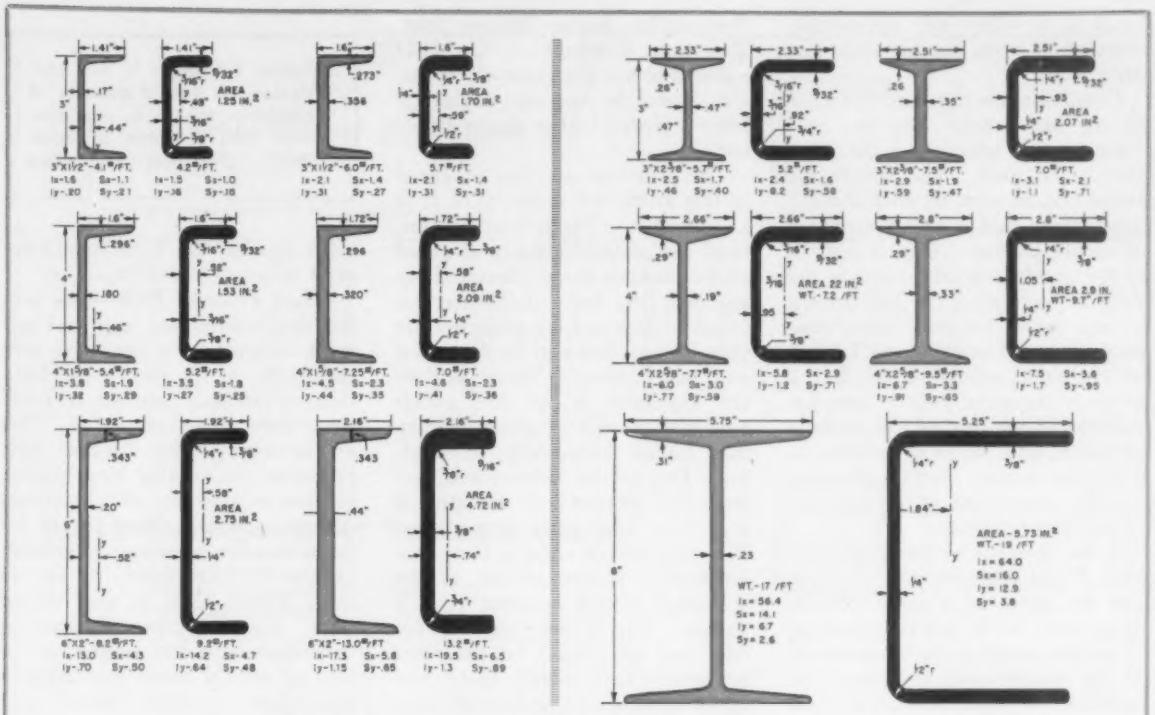

Figs. 1 and 2—Dimensions, weights, and properties of rolled channels and I beams are compared with cast C sections. I = moment of inertia and S = section modulus

Design Properties

. . . of Four Streamlined Cast Sections

In continuing his discussion of design of cast parts for optimum performance in service, the author presents extensive comparative data on tubular, omega, C, and U-shaped cast sections

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Foundry Consultant
Cincinnati

● PREVIOUS ARTICLES[1, 2] discussed streamlined cast design from the standpoint of both static and dynamic loading. In the last article[2] cast junctions were discussed from the standpoint of both stress concentration and castability. A rather remarkable similarity exists between stress concentration and castability in all junctions studied so far by stress and thermal analysis.[3]

These studies indicate that the larger the radius connecting two sections of dissimilar size, or making a junction, the better for both stress concentration and castability. Practical considerations, particularly over-all dimensions and section modulus, limit the size of the radius. A practical compromise is a radius equal to the section thickness, 1t, or to the smaller section if there are two dissimilar sections. The 1t radius most usually causes stress concentration in service under $1.2K_t$. Radiuses much larger than 1t are

required to effect any appreciable decrease in stress concentration under $1.2K_t$.

Combining the junctions discussed in the last article[2] into cast sections requires selection of the junction to be used. The section selected can, in turn, be used to make connecting, load-carrying members of usable castings. Figs. 8 and 10 of the previous article[2] indicate the 1t-2t L junction as the best known to the writer for both stress concentration and castability. Table I of the same article shows that a properly designed 1t-2t L junction exhibits 99 per cent of the moment of inertia and radius of gyration of a square corner. Section modulus can be maintained at 79 per cent of the square corner.

It has been the writer's experience that if just one over-all dimension can be increased a small fraction of an inch the 21 per cent decrease in section modulus can be overcome. If the section modulus cannot be increased, a slight increase in yield strength will overcome the lower section modulus of the rounded corner under static loading. The lower stress concentration of the rounded corner will overshadow the theoretically higher fatigue load. The only drawback to the 1t-2t rounded corner if an over-all dimension cannot be increased slightly is lower stiffness, higher elastic deflection.

The four cast sections advanced in this article are made up of 1t-2t L junctions. These four streamlined cast sections are not advanced as the ultimate in cast design. They are only the best the writer has found to date and are advanced not only for use, but also for discussion and improvement. These sections are applicable to all cast metals with the possible exception of gray iron loaded transversely, in bending. Due to the difference in tension and compression strengths of gray iron, a properly proportioned T section has advantages. Gray iron fortunately is not subject to the shrinkage defects inherent in a T section. The T junction does not offer any advantages for the other commonly cast metals that show about equal tension and compression strengths. It is to everyone's advantage to use a streamlined, castable junction like the 1t-2t L junction if this junction can be incorporated in cast sections with properties equal to the T, or other junctions of poorer castability.

Tables I through IV are condensed. A limited quantity of complete tables is available from John B. Caine, 5 Linden Drive, Cincinnati 15, Ohio

Offers Property Data—One reason that streamlined, cast load-carrying sections have not been used extensively in the past is the laborious calculations necessary to determine their design properties. This article supplies the designer with properties in tabular form similar to those supplied for rolled sections. Although casting allows for an infinite number of shapes, standardization is advantageous if for no other reason than to save design time. The C sections discussed in this report have been selected as the best of several dozen cast-to-shape equivalents of rolled channels and I beams.

The C sections of Figs. 1 and 2 exhibit moments of inertia, section moduli, over-all dimensions, and weights comparable to rolled chan-

Figs. 3 and 4—Design properties of cast tubular, omega, and U sections of several sizes are compared. I = moment of inertia and S = section modulus

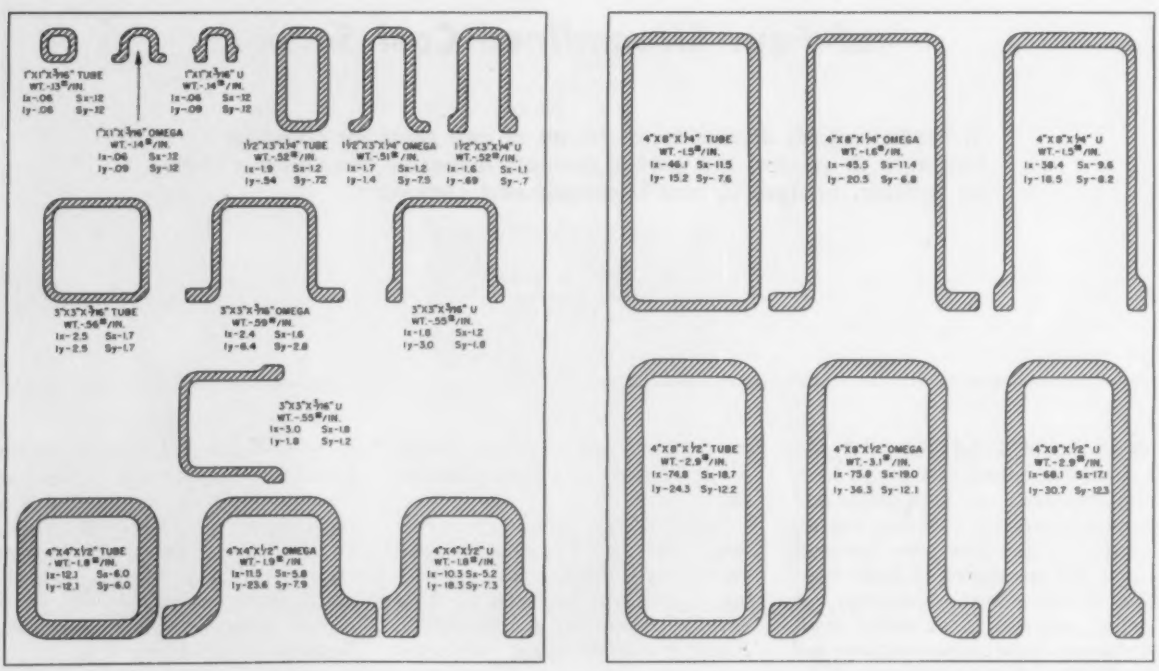
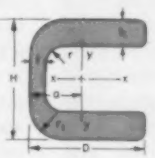


TABLE I—Properties of C Sections

I = Moment of Inertia
S = Section Modulus
r = Radius of Gyration
X axis on centerline; Y axis as given

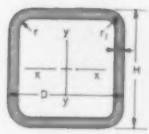


Dimensions						X Axis			Y Axis					Weight
H	D	t	t_2	r	r_1	I	S	r	I	S	r	a	Area	psi
in.	in.	in.	in.	in.	in.	in.⁴	in.³	in.	in.⁴	in.³	in.	in.	in.²	steel
1	½	5/32	5/32	1/32	1/8	.02	.05	.23	.02	.07	.23	.23	.37	.10
2	1	7/32	7/32	7/32	1/8	.37	.37	.65	.06	.09	.26	.39	.87	.24
3	2	¼	⅛	¼	¼	2.9	1.9	1.2	.62	.52	.55	.80	2.05	.57
4	2	½	⅛	¼	½	5.3	2.7	1.5	.66	.51	.53	.70	2.32	.65
5	6	⅛	7/32	⅛	¼	34.0	13.6	2.1	28.5	9.1	1.9	2.85	7.80	2.2
6	9	½	¼	½	1	92.0	30.6	2.5	82.5	15.7	2.4	3.78	14.8	4.1

NOTE: These are preliminary properties subject to correction.

TABLE II—Properties of Tubular Sections

I = Moment of Inertia
S = Section Modulus
r = Radius of Gyration
X and Y axes on centerlines

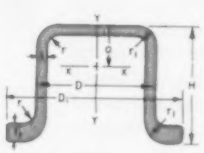


Dimensions					X Axis			Y Axis				Weight
D	H	t	r	r_1	I	S	r	I	S	r	Area	psi
in.	in.	in.	in.	in.	in.⁴	in.³	in.	in.⁴	in.³	in.	in.²	steel
1	1	5/32	5/32	⅛	.06	.12	.35	.06	.12	.35	.48	.13
2	2	7/32	7/32	⅛	.63	.63	.71	.63	.63	.71	1.3	.35
3	3	¼	¼	¼	3.3	2.2	1.1	3.3	2.2	1.1	2.5	.71
4	5	⅛	⅛	¼	18.2	7.3	1.8	13.0	6.5	1.5	5.8	1.6
5	6	⅛	⅛	¾	35.5	10.8	2.2	27.8	11.1	1.9	7.4	2.1
6	8	⅛	⅛	½	90.0	22.5	3.0	60.0	20.0	2.5	9.8	2.7

NOTE: These are preliminary properties subject to correction.

TABLE III—Properties of Omega Sections

I = Moment of Inertia
S = Section Modulus
r = Radius of Gyration
X axis as given; Y axis on centerline

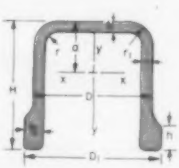


Dimensions							X Axis				Y Axis				Weight
D	H	D_1	t	t_1	r	r_1	I	S	r	a	I	S	r	Area	psi
in.	in.	in.	in.	in.	in.	in.	in.⁴	in.³	in.	in.	in.⁴	in.³	in.	in.²	steel
1	1	1½	5/32	¼	5/32	⅛	.06	.12	.35	.50	.09	.12	.42	.50	.14
2	2	3	7/32	¼	7/32	⅛	.59	.59	.67	1.0	1.0	.67	.87	1.3	.37
3	5	4½	⅛	¼	⅛	¼	14.2	5.7	1.7	2.5	8.9	3.9	1.3	5.1	1.4
4	4	6	⅛	¼	⅛	¼	10.0	5.0	1.4	1.9	17.3	5.8	1.8	5.1	1.4
5	5	7½	¼	1	¼	1	24.5	9.8	1.7	2.5	46.0	12.3	2.3	8.5	2.4
6	6	9	¼	½	¼	½	30.2	10.1	2.3	3.1	47.1	10.5	2.8	5.8	1.6

NOTE: These are preliminary properties subject to corrections.

TABLE IV—Properties of U Sections

I = Moment of Inertia
S = Section Modulus
r = Radius of Gyration
X axis as given; Y axis on centerline



Dimensions									X Axis				Y Axis				Weight
D	H	D_1	t	t_1	t_2	h	r	r_1	I	S	r	a	I	S	r	Area	psi
in.	in.	in.	in.	in.	in.	in.	in.	in.	in.⁴	in.³	in.	in.	in.⁴	in.³	in.	in.²	steel
1	1	1 7/32	5/32	5/32	5/32	⅛	1/32	⅛	.06	.12	.35	.50	.09	.12	.35	.50	.14
2	3	2½	¼	¼	¼	¼	¼	¼	2.1	1.4	1.0	1.5	1.5	1.2	.85	2.1	.59
3	4	3½	¼	¼	¼	¾	¼	¼	5.1	2.6	1.3	1.8	5.0	2.9	1.3	3.1	.87
4	6	4½	⅛	7/32	¼	1	⅛	¼	24.7	8.2	1.9	3.0	19.5	8.2	1.7	6.8	1.9
5	8	5½	¼	⅛	¼	1	¼	¼	42.0	10.5	2.6	3.7	26.3	9.6	2.1	6.2	1.7
6	10	6½	¼	⅛	¼	1	¼	¼	87.0	17.4	3.4	4.5	52.2	16.1	2.6	7.7	2.2

NOTE: These are preliminary properties subject to correction.

nels and I beams. They should cause appreciably lower stress concentration if positioned correctly than standard rolled shapes due to their rounded corners. When the depth of the C section is increased over that of standard rolled sections, it develops quite high stiffness and load-carrying ability about its Y axis. When the depth of the C section is increased to about 1.5 times its height, the section exhibits approximately equal properties about both the X and Y axes. The C section eliminates the sharp corners of the rolled channel and the two T junctions of the I beam section with a corresponding improvement in castability.

The channel, or C section always has been thought vulnerable to concentrated loads on the unsupported sides. This is true when used in long lengths as are rolled channels. This objection is minimized in cast design because the C section always is incorporated in a more complex casting. The flange members are supported by their connections to the rest of the casting and the unsupported lengths are relatively short.

A Comparison Is Made—A detailed comparison between some cast, streamlined C sections and their rolled counterparts is given in Figs. 1 and 2. The design properties of C sections in small increments from 1 in. to 6 in. in height and depth are given in Table I. The ratio of 1:1.5 selected between web and flange thicknesses in Table I not only places the metal where it will do the most good, but also displaces the Y axis away from the web member so that this member becomes a fairly efficient load-carrying member about the Y axis.

The hollow tube, omega, and U sections of Figs. 3 and 4 are advanced as improvements on the simpler C section when nearly equal properties are needed about both X and Y axes. The hollow tube is accepted as having the highest section modulus about both X and Y axes. The streamlined, cast tubular sections of Fig. 3 and Table II have this advantage, plus the rounded corners that decrease stress concentration in torsion to under 1.2. Stress concentration in tension in the single corners making up the tube is less than 1.1.[3]

Cast, hollow tubular sections have only one drawback, cost. All require cores. The omega and U sections of Figs. 3 and 4, and Tables III and IV are advanced as sections with properties approximately equal to the tube that usually can be cast without cores. It is self-evident that the properties of a tube cannot be equalled by any other section of the same over-all dimensions and weight. If the over-all dimensions are not critical, the omega section is an ideal section. Stress concentration is under 1.2 and castability follows this low stress concentration.

U Section Is Compromise—If over-all dimensions are critical, the U section is the best compromise found so far between over-all dimensions, stress concentration, and cost. The lowest moments of inertia of the smaller U sections are very nearly equal those of the tubular sections. As the over-all dimensions increase, the moments of inertia of the U sections with thin walls decrease in relation to those of the tubular sections. The U sections with thicker wall sections exhibit moments of inertia close to those of comparable tubular sections. The relation is complex and can be shown best by a series of sketches, Figs. 3 and 4. Exact details can be obtained from Tables II, III, and IV, which list the design properties in small increments of size.

The U section, as well as the C section, can be stressed in either of two positions as shown by the 3 x 3 in. section of Fig. 3. This ability

Fig. 6—These data on streamlined cast corners will aid in designing sections not listed in the tables

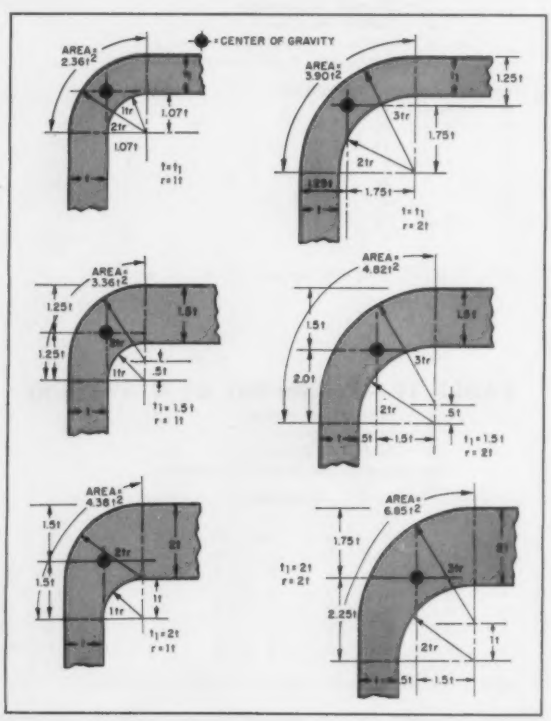
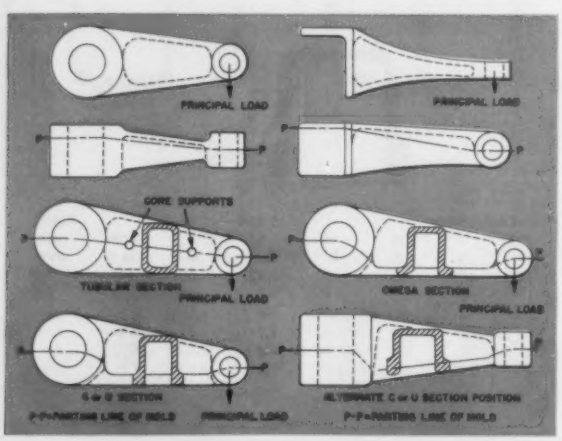


Fig. 5—These mold positions of levers in relation to principal load are suggested for lowest cost



becomes important when the position in service conflicts with the position necessary in the mold for molding without cores. This point will be discussed in detail later.

Both streamlining and castability have been sacrificed for compactness in the U section. If the open end of the U is kept in compression, stress concentration will equal that of the tube or omega sections. If the open end is in any other position, actual stress concentration values must await study. Following the section back upon itself, as has been done with the U section creates a hot spot that will show slight centerline shrinkage when cast with metals of high apparent shrinkage, such as steel. This slight shrinkage will occur in an area of relatively low stress and should not condemn the casting without study. It is not difficult to eliminate this shrinkage, but the temperature gradients necessary to eliminate the shrinkage may cause much more dangerous hot tears in highly stressed areas. The elimination of this slight shrinkage will certainly increase cost.

Stress Considerations—Stress concentration values given in this article apply only to the sections as shown. When they are used in castings, attention must be paid to the proper blending of these sections to the other parts, or sections of the casting. In many instances these junctions are the critically stressed areas and must be considered. Proper blending of these junctions will tend to equalize stresses throughout the cast part. Moments of inertia and over-all dimensions usually do not limit the blending radiuses and they should be as large and as sweeping as possible. Five and ten-inch radiuses are not impractical; in fact they are very practical. If at all possible the casting as a whole should be stress analyzed by brittle lacquer, or similar methods for unexpected points of stress concentration. The stress pattern in even a simple casting is hard to theorize. Actual analysis is the only way to be sure.

As shown in Fig. 5, the sections must be positioned in the mold correctly for lowest cost. This is true, even for the tubular sections, because the openings necessary to support the core should be at the parting line of the mold and also at the neutral axis. Proper positioning of the omega, C, and U sections is doubly important to eliminate cores. In those instances when proper position in the mold cannot be reconciled with the direction of the principal stress, the approximate equal properties of many of these sections about both the X and Y axes can be used to advantage.

If these sections are to be used in compression or torsion the radiuses of gyration of the square tubular sections are equal about the X and Y axes. Comparable omega sections show radiuses of gyration about the X axis about equal to those of the tubes. Omega radiuses of gyration about the Y axis are higher than those for tubular sections. Equal radiuses of gyration about both axes are obtained with the U section when H (Table IV) is ½ to 1 in. greater than D. This proportion is of interest. If cast sections not listed in the tables are required, details of the rounded corners given in Fig. 6 will expedite design calculations.

Some of the cast sections with 3/16-in. webs listed in the tables are too thin to cast with steel, unless the parts are small castings or investment castings poured in heated molds. The steel foundry should be consulted if 3/16 in. sections are contemplated. All sections should be castable with other metals. The properties are calculated for a two to three degree pattern draft. In certain instances this may not be enough draft and these instances must be settled by mutual agreement. The omega section is particularly adapted to deep pockets that require more than minimum pattern draft.

Application Examples—It should be emphasized that the levers of Fig. 5 are only examples. The cast sections described in this article have much wider applications. Bell cranks, brackets, and stiffening members are just a few. The omega section can be applied to gear cases and covers, gear and wheel webs, and innumerable other shapes to eliminate stiffening ribs that are prime sources of stress concentration. Fig. 1 of a previous article[1] is a good example of the application of the C, tube, and U sections to a lever. The higher moments of inertia and section moduli of these cast sections cause lower applied stress. This lower stress can be used to increase load-carrying capacity, decrease weight, or allow the use of a lower strength, cheaper, more foolproof metal.

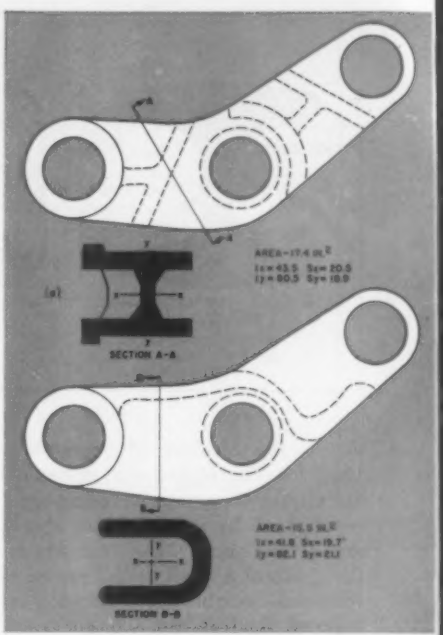


Fig. 7—Using a C section for a bell crank eliminates a point of stress and poor castability

Fig. 7 shows the application of the C section to a bell crank to eliminate a point of stress concentration and poor castability through the X axis of Fig. 7a. Fig. 8 shows an application by Marek[4] of an omega section to a bracket. Use of the omega section decreases stress concentration and eliminates a core.

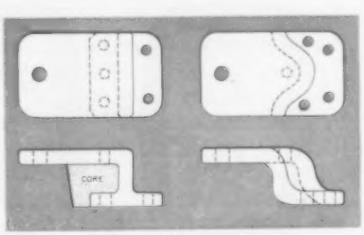


Fig. 8—Using an omega section in a bracket decreases stress and eliminates need for a core

The forged I beam section of Fig. 9a is common. Like all I beam sections it is quite efficient. The substitution of a cast C section of the same over-all dimensions, like

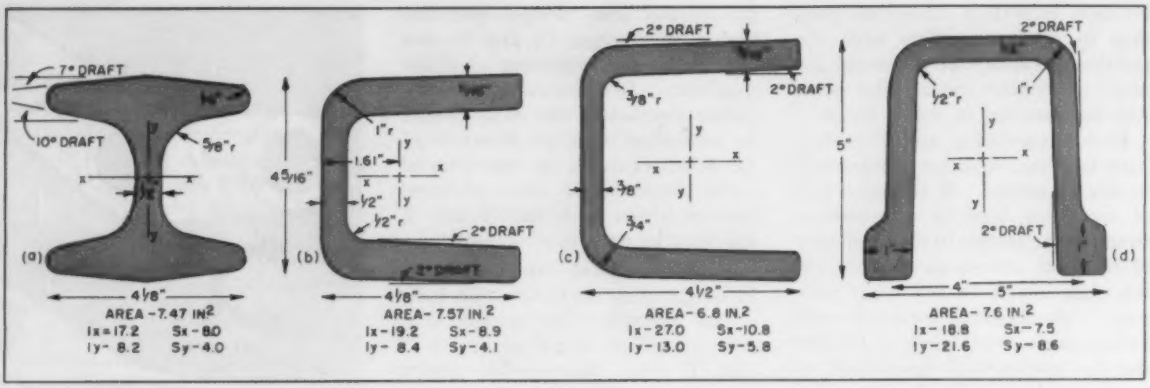


Fig. 9—Comparison of a forged I beam section with cast sections

that of Fig. 9b does offer some advantage. The higher section modulus of the C section decreases imposed load by 10 per cent about the X axis and 3 per cent about the Y axis at a sacrifice of 2 per cent additional weight. This decrease in imposed load is not too great an incentive for the designer to change to a casting.

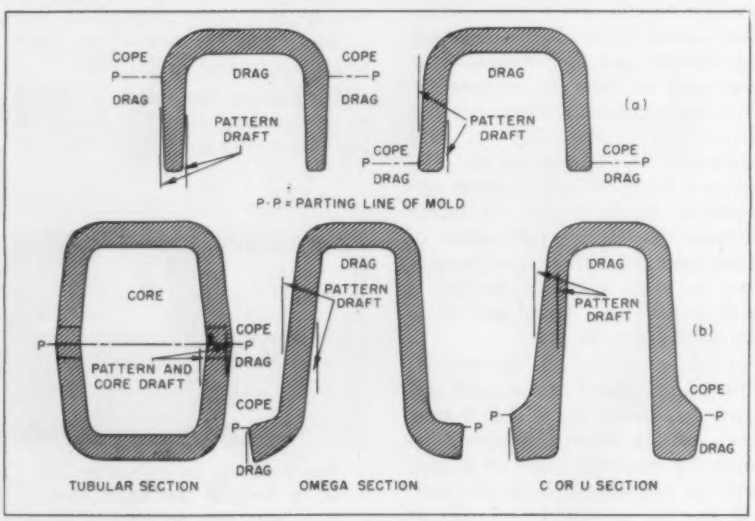
If the over-all dimensions of the part allow just a slight increase in one, or both dimensions of the section, appreciable decreases in imposed load and increases in load-carrying ability are possible. Fig. 9c shows that increasing the over-all dimensions of Fig. 9b by just fractions of an inch along with a slight decrease in section thickness increases the load-carrying ability, as determined by section modulus, 30 to 35 per cent with a 9 per cent decrease in weight. This increase is significant and should interest the designer. Weight can be decreased (limited by castability), load-carrying ability can be increased, or a softer, cheaper metal possibly can be substituted. The latter possibility is quite attractive if a high strength metal now is used, because it means better machinability. For example, a carbon steel can be substituted for a heat treated alloy steel due to the increased section modulus of Fig. 9c, compared with Figs. 9a and 9b.

Effect of Casting Complexity—The C sections of Fig. 9 have been drawn in their proper position to the principal load. The sections must be turned 90° to be molded without cores. This usually can be done, especially with levers. If the complexity of the casting does not allow this, a core is needed for the C section, or the U section of Fig. 9d can be substituted. Unfortunately, the open end of the U section makes it impossible to develop section moduli about the X axis high enough to substitute for a properly positioned C section without a further increase in one over-all dimension. A choice must be made, based usually on economics, between a cored C section made of a lower strength metal, or an uncored U section made of a slightly higher strength metal if over-all dimensions are critical.

If the decision is made to use a cored C section, the possibility of a tubular section should be considered. The final decision, again, will be mostly economic, based on castability, because the section thickness must be decreased for the same weight tube. This seemingly involved procedure can be accomplished in minutes by comparing the properties and weights in Tables I through IV for given over-all dimensions.

Pattern draft, pattern manufacture, and positioning of the pattern in the mold usually are not considered in the realm of design. However, the designer should be familiar with some of the fundamentals. Some details were shown in Fig. 5. The C section can be molded in two ways, as in Fig. 10a. One method involves double draft on the members that are molded vertically. In some instances this will be unacceptable, because the double draft will decrease section modulus too much. A solution is to

Fig. 10—Details of pattern draft required for cast sections described in this article. The draft is exaggerated for clarity



make the section in both cope and drag as shown in Fig. 10a. This molding method gives uniform sections. It may be necessary to make the C section with double draft in some instances because of the complexity of the casting as a whole. This is one of the many points requiring that indefinite and sometimes exasperating "consultation between the designer and foundry." If the designer is familiar with some of these details the consultation can be a phone call.

The omega and U sections always require a complex parting and always can be made with uniform sections, as in Fig. 10b.

Corners Are Important—Corner radiuses at least 10 per cent of the section thickness are a must for both stress concentration and castability.[2] The corner radiuses shown in Fig. 11 need not be exact, 10 to 20 per cent of the section thickness seems close enough. It will save design time as well as decrease confusion if a blanket notation is made to this effect on either the drawing itself, or in a separate pattern specification. Although all evidence indicates that a rounded cast corner is stronger in fatigue than a sharp machined corner, the radiuses recommended in Fig. 11 will machine out with normal machine finish stock.

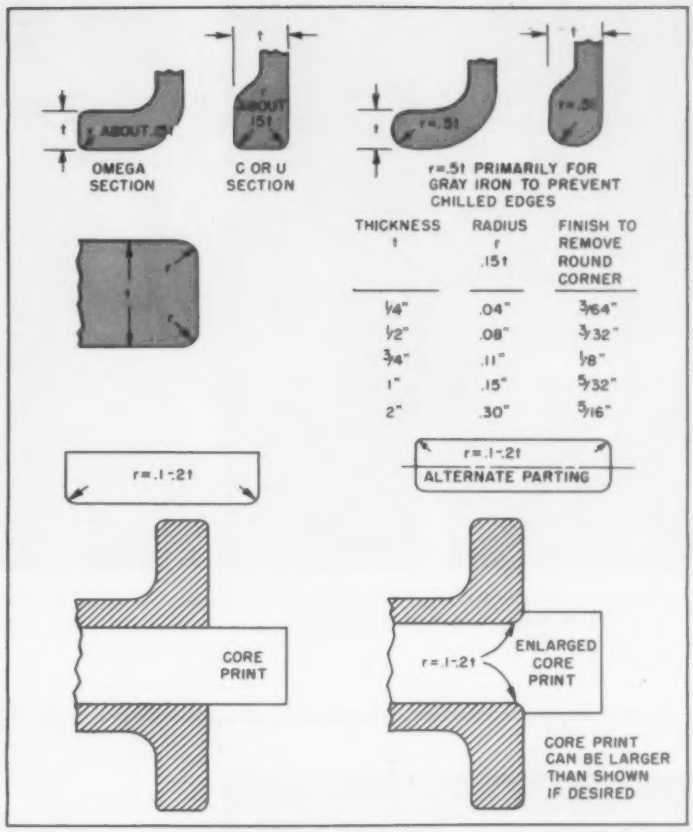


Fig. 11—Cast corners must be rounded with radiuses of at least 10 per cent to reduce stress concentration and obtain good castability

Most rounded corners on patterns can be made easily with sandpaper and a simple templet. There are two exceptions, as shown in Fig. 11. One is where the corner comes at a parting in a mold. The other is where a core leaves the casting cavity to be supported by a core print. Corner radiuses are easily introduced at these locations if specified before the pattern is made. Almost a new pattern is required to round these corners after the pattern is made. The designer is about the only one who can initiate this pattern construction. It is too late when the foundry receives the pattern. This detail can also be handled by a blanket notation on the print or in a specification.

Fillet Radiuses—Another seeming detail that can become quite costly unless understood by everyone is the tolerances specified for fillet radiuses. As has been shown in previous articles,[2] stress concentration changes little with minor changes in the radius when large radiuses are used. Pattern junctions with large radiuses cannot be made by gluing two pieces of wood together and adding a leather fillet. They must be formed from a solid piece. If the radius is specified exactly, nonstandard routers are needed to compensate for patternmaker's shrinkage. If a slight tolerance is allowed, standard routers can be used to decrease cost and expedite delivery.

A similar situation exists for the large radiuses used to connect parts of the casting. These 3, 4, 5, perhaps 10-in. radiuses are quite costly to incorporate in a pattern if they are specified exactly. They are not particularly difficult if all that is required is that the wall section be maintained and the sections blended together with radiuses that may vary 10 to 25 per cent of those specified.

A notation or specification similar to the following is suggested for these details.

1. Break all corners to 10 to 20 per cent of the section thickness. Move partings away from corners and enlarge core prints so that these corners can be broken to 10 to 20 per cent of the section thickness.

2. Unless otherwise specified, fillet radiuses 1/4 in. to 1 in. may vary plus or minus 10 per cent from that shown on the drawing or print.

3. Radiuses larger than 1 in. may vary up to 25 per cent of that specified provided the wall section is maintained and the sections are blended with a form pleasing to the eye.

The writer is indebted to Duncan Foundry & Machine Works Inc. and Grede Foundries Inc. for their support of this work.

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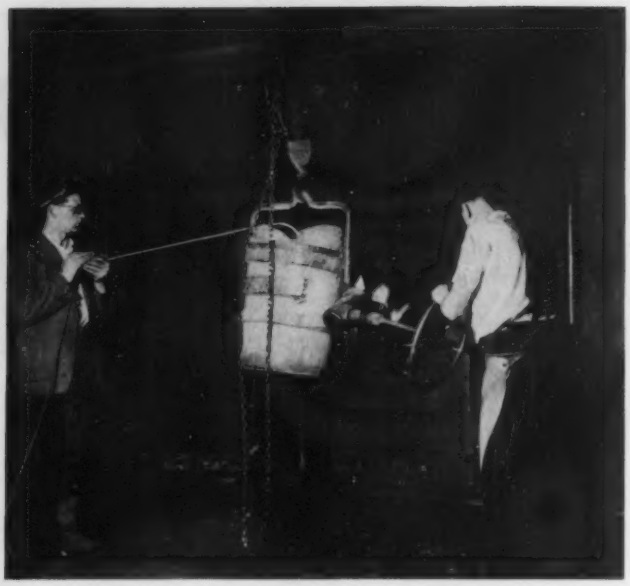
Measuring temperature of molten iron in the spout of a 17-ton tilting electric arc furnace



Measuring temperature of gray iron during pouring of a cylinder block casting in the Ford foundry

Thermocouple Practice in Ferrous Foundry

TEMPERATURE CONTROL

Quick-immersion thermocouples provide close control of casting conditions and furnish permanent records of the temperatures of individual melts

By H. O'CONNOR

● QUICK-IMMERSION thermocouples provide rapid, accurate measurement of gray iron and alloy steel melts at Ford Motor Co. Ltd.'s Thames and Dagenham foundries in England. These plants supply the company's requirements for auto, truck, and tractor castings in these metals.

Accurate control of molten metal temperatures is of great importance in the continuous, large-scale production of a wide variety of castings in a number of alloys.

Certain alloys are sufficiently temperature sensitive to cause a substantial increase in casting rejects if casting temperatures deviate from the optimum determined by experience. In addition, it is highly desirable to have an accurate record of the temperatures of steels held in electric arc furnaces and receivers before they are poured into the ladles.

For some years the temperatures of molten metals used in the foundry were measured with optical pyrometers, but the company desired to avoid human error and also to obtain automatic and permanent records of the temperatures measured.

The quick-immersion thermocouple now used employs a suitably sheathed platinum, 13 per cent rhodium-platinum couple and an

Taking an immersion reading to determine alloy steel temperature in the ladle before casting a crankshaft. Measurements are taken at 5-minute intervals to provide accurate control of the melting process

automatic indicating-recording instrument.

Ford has employed this method with great success for more than five years. It has provided close control over casting conditions and assists in investigation of refractory and sand problems. Above all, it permits a high degree of confidence in the permanent records of the temperatures of individual melts. If defects occur in castings, these records rule out the possibility of human error in temperature measurement being responsible.

All of these thermocouples are of the same pattern. A pair of platinum, 13 per cent rhodium-platinum thermocouple wires pass through insulators in a mild steel tube about 4 ft long which has a right-angle bend about 18 in. long. Surplus wire is held on reels in a head box fitted at one end. At the other end, the two wires forming the junction are protected by a thin silica sheath, closed at one end and fitted into a graphite plug.

The graphite plug is pressed into a graphite sleeve which protects the bottom 18 in. of the couple. To extend the life of the silica sheath and the thermocouple junction in the measurement of gray iron temperatures (1375 to 1430° C) an expendable graphite sheath is used to protect the silica sheath. This graphite sheath is replaced every 50 readings, the silica sheath every 150 readings.

After 200 to 300 dips, the thermocouple junction is renewed by cutting off about 1 in. of the wires, drawing down fresh wire from the reel, and making a new twisted junction. About 12 ft of wire is stored on the reels in the thermocouple-head boxes. No graphite sheath is used for the measurement of alloy steel temperatures (1510 to 1540° C), for which a speedy reading is essential. In this application, the silica sheath is replaced after five or six readings.

Twenty-four hour recording instruments are used to give a visual indication of the temperature measured and to provide a permanent record of each cylinder block or other casting produced. This procedure furnishes valuable data for investigating the cause of any faults detected at a later date.

Casting temperatures vary with the alloy employed and with the size and shape of the individual casting concerned. Gray iron cylinder blocks for tractors, for example, are cast at a temperature in the range of 1375 to 1420° C. Alloy steel crankshafts are cast at 1530 to 1540° C.

An interesting application of the quick-immersion thermocouple is in the control of the melting process of the alloy steel for cast crankshafts. A cupola melts low-carbon iron (2.3 per cent carbon) which is tapped into a 15-ton electric furnace. Also charged into this furnace is a burden of cold low-carbon steel (approximately 0.4 per cent carbon), which comprises about 50 per cent by weight of the total charge. The electric furnace discharges into a receiver where the temperature is measured and recorded every five minutes. The temperature range is the controlling factor in the balancing of the two charge constituents and in any adjustment of composition found necessary.

The indicating-recording instrument employed with the thermocouple used in this procedure is fitted with a time-controlled bell to give an audible warning when the highest temperature is reached during each dip. This precaution prevents undue immersion of the couple in the metal and consequently reduces the attack on the silica sheath. In addition, a permanent record of the temperature is obtained for reference in the future.

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Questions and Answers

Requests suggestions on binding agents for formulation of investment materials . . . Runs into numerous problems in making yellow brass and aluminum castings . . . Fault may lie in use of sand which is too fine

Investment Casting of Steel

Located in India, I want to make small plain carbon steel castings (0.40 C) weighing 8 oz, 200 pieces per day, by the precision piece mold method. The only information I have been able to find has been general in nature, and I desire more details. Ethyl silicate has been suggested as a binder, but the difficulty is that it is not regularly available here. I understand that sodium silicate, bentonite, or alumina cement can be used, and wonder if you could give some information on those materials.

In general, most of the investment molders use ethyl silicate as the binding agent although from time to time references have been made to the other materials you mention.

In employing sodium silicate as a binder for precoating the wax pattern, which then is coated with a coarser grain backing, the following procedure has been used. The precoat is made by dry mixing 94 grams silica flour (−325 mesh), 56 grams alumina (−325 mesh), 37 grams silica sand (40 mesh). After the materials are mixed well, 80 cc of liquid binder is added and mixed to provide the proper consistency. Binder is composed of one part of 20°Be sodium silicate and four parts 2 per cent polyvinyl alcohol.

The pattern is dipped in the precoat. When it is partially set, the pattern may be treated by two methods. One is to stucco or pour coarse silica sand (−35 to 48 mesh) over the damp pattern, dip again in the precoat and stucco, until a shell of satisfactory thickness is developed.

The other method is to back the precoated pattern with a slurry composed of 6 grams magnesium oxide, 18.8 grams primary calcium phosphate, 240 grams 70 to 100 mesh silica sand, and 135 cc water. Another backing slurry is composed of 240 grams of 70 to 100 mesh sand, 12.6 grams high-temperature alumina cement, and 73 cc water.

Other possibilities include 20 grams monobasic magnesium phosphate, 100 cc 0.1 per cent aerosol water solution which is mixed with −325 mesh refractory such as silica flour, sillimanite, zircon flour, etc. in the proportion of 100 cc of solution with 240 grams of refractory. Another is composed of 90 grams silica flour, 6 grams magnesium oxide, 3 grams monobasic ammonium phosphate, 1 gram monobasic sodium phosphate, and 50 cc of water.

Since the information you have on investment molding practice essentially is general in nature, we suggest that you obtain a copy of *Investment Casting for Engineers* by Wood and von Ludwig which contains detailed information on methods and practices.

Nonferrous Foundry Problems

We operate a foundry pouring yellow brass and aluminum to produce decorative accessories. Many of them have fine detail which is buffed and polished and others are machined and polished. In common with most brass foundries, we suppose, we have quality problems. First is nonmetallic inclusions or dross in brass castings. Second is shrinkage in brass and aluminum castings. Third is surface detail reproduction, and fourth is gas porosity in aluminum castings.

We understand some of the details which must be under constant scrutiny and control for successful casting production, and are getting passable but far from excellent results. We are contemplating some changes in the physical arrangements in our foundry, and would like your advice on the following: We are melting with natural gas in both crucible and reverberatory furnaces. Would a change to fuel oil be likely to make a change for the better in melt quality so far as dissolved gas or nonmetallic inclusions are concerned?

We are using Albany natural sands at a moisture level of 5 to 6 per cent. We are thinking of going to a synthetic sand system with mechanical handling and would like to know: Can a synthetic sand be compounded which will give surface finish and detail reproduction equivalent to No. 00 Albany sand and have superior properties so far as moisture, strength, permeability, moldability, etc. are concerned? If so what would be a good recipe for such sand? We want to try out a small lot before we do much planning on a mechanical handling system. Could we expect to get definite quality improvements in our brass and aluminum castings, judged by freedom from porosity and nonmetallic inclusions, by using such a sand?

Your problems are not uncommon, and we suggest that before making any changes in fuel, for example, you make a thorough study of your melting procedures as well as the raw materials melted. The raw materials, in addition to possessing suitable quality, should be clean and dry. Consideration should be given to the adjustment of the burners on the furnaces so that a slightly oxidizing atmosphere is maintained in the furnaces. If the atmosphere is reducing, gases will be picked up by the molten alloys; if highly oxidizing, considerable oxides and drosses will be formed. Either of those two furnace conditions will result in poor quality metal.

Best method of determining the condition of the furnace atmosphere is through gas analysis with an Orsat or other apparatus. A method used by some to give a rough indication is to insert a piece of clean cold slab zinc in the flame

for a few seconds and observe its surface appearance. If soot is deposited, it is an indication of a reducing flame. If it remains clear and clean, the flame is neutral. A yellowish deposit is an indication of an oxidizing flame, and the more pronounced the deposit, the greater the oxidizing condition.

Sometimes, in spite of all the care taken in melting aluminum alloys, the metal tends to pick up gas, particularly when atmospheric humidity is high. Under such conditions one must resort to degasification through use of gaseous chlorine or solid chlorine-bearing compounds, or nitrogen gas. With brasses little trouble is encountered from that source because the volatilization of zinc mechanically removes absorbed gases.

Hold stirring to the minimum. If you feel that you must stir the molten metal, allow it to stand for a short time before pouring so that any dross and inclusions stirred into the metal have a chance to rise to the top of the bath. Skimming should be confined to the top surface and be just sufficient to remove any slag, dross, etc.

Shrinkage in castings usually is due to improper gating, and a careful study will have to be made to determine the most suitable system for each. Gates that are too small freeze off before the casting solidifies and prevent feeding. They also require higher than necessary pouring temperatures. Small gates may be a partial cause of the lack of detail you mention since they do not permit the metal to fill the cavity properly.

Excellent results have been obtained in gating systems where the runner in the drag extends a short distance beyond the last gate, and the gates are taken off at the top or cope and lead into the casting cavities. The runner extension and the gates on the top are reported to promote better filling and minimize entrance of dirt, etc. into the casting cavity. It probably would be worthwhile to consider those and rearrange your gating.

As to sand, if you are using No. 00 Albany, which is indicated as having a grain fineness number of 210 and over, it should provide the desired reproduction of detail in the pattern. In general, the sand selected for any given operation is a compromise which will give the smoothest surface without resulting in blows in the casting. Fine sands produce the smoothest surfaces and the best reproducibility of pattern detail, but they lack permeability, and that must be taken into consideration.

Your moisture content—5 to 6 per cent—is on the low side, and we suggest you try 6 to 7 per cent. Also it will be worthwhile to have your present sand analyzed to determine its characteristics and properties. You may find that some slight adjustment may result in considerable improvement.

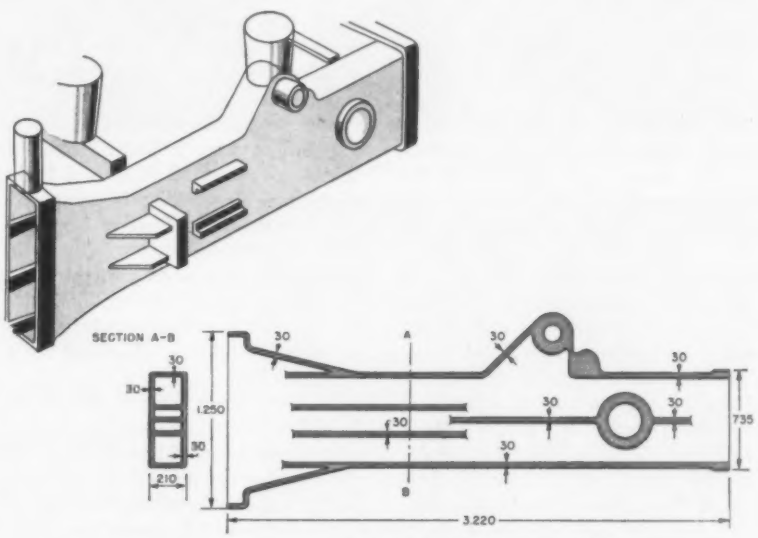
Development of a suitable synthetic sand requires considerable time and effort as well as sand testing equipment to ascertain properties in the experimental work and, after establishment of a suitable sand, to provide a system of control. Before starting such a program you will have to ascertain the characteristics and properties of your present sand and its shortcomings for your operation. Then you can determine the direction to go to obtain improvement. You could use your present sand as the base, or blend other sands together to attain the desired results. Probably the best method would be to obtain the services of a sand consultant to study the situation and recommend the best procedure.

Fine Sand Causes Blowholes

In our foundry in Spain we are producing carbon steel castings in molds made by the CO_2 process, but are having trouble with gas holes. We are using a silica sand of AFS fineness 85, 6 per cent silicate binder with a 2.7 ratio, 3 per cent sawdust, and 3 per cent coal dust.

The dry sand is placed in the mixer and after it is in operation the sawdust and coal dust are added and mixed for 3 minutes. Then the silicate is added and the batch mixed for 3 minutes more. After the molds are made, CO_2 is injected at 1.5 to 2 kg per sq mm.

We have tried baking the molds at 250° C, but the gas holes persist. When the mold is gated properly in the cope, the gases escape and no problem is encountered. We are enclosing a sketch of one of the castings, a large press frame, with which trouble is encountered. We also are interested in a method of recovering sand after shakeout.



Sketch of the pressframe casting. Dimensions are in millimmeters

In our opinion, your difficulty with blows in the steel castings is not in the process employed, but in the relatively fine sand you are using. For a casting of the size indicated we would expect a sand with a grain fineness of 40 to 50 would be much more suitable—in fact, essential in producing castings free from the possibility of blows.

That the sand is the cause of the trouble is indicated by the fact that even when the molds are relatively

free from moisture through baking, you still run into blowholes.

Possibly some of the difficulty arises from the seemingly high additions of sawdust and coal dust, which are gas-forming agents. While we are not sure, we suspect that those materials are used to eliminate sand expansion difficulties rather than to aid in sand disintegration on shakeout. That again would point to the sand being too fine for the job.

With a coarser sand, as suggested, the amount of silicate binder required would be less than for the finer sand—probably around 4 per cent instead of 6 per cent. We also would suggest that the use of sawdust be eliminated and the coal dust addition be held to 2 per cent. However, you probably will have to experiment to determine which additives to use, and their amounts.

Reclaiming CO_2 sand involves washing and drying in one method. The hardened sand from the shakeout is crushed and carried through a log washer—a mining device which consists of a rotating conveyor screw mounted at an angle of about 20° over which water flows—which removes 80 per cent or more of the silicate. Washed sand ejected at the top end of the screw conveyor then is dried.

A more recent reclaiming procedure involves the use of pneumatic scrubbing units or aerating type mullers. Results obtained were described by G. C. Warneke, National Malleable & Steel Castings Co., Melrose Park, Ill., in a paper presented at the recent annual meeting of the American Foundrymen's Society.

Reducing Phosphorus in Iron

In our country we have high-phosphorus iron ores and we understand that this element cannot be lowered in the blast furnace. We would like to know if it is possible to treat the resulting pig iron in the cupola, electric furnce, etc. so that the phosphorus could be reduced to 0.20 to 0.30 per cent.

Phosphorus in iron can be reduced by treatment with highly basic and oxidizing slags. That practice is common in this country in production of steel by the basic openhearth or electric furnace process, and on the Continent by use of the basic-lined converter.

Reduction in phosphorus, however, is accompanied by high losses in carbon, silicon and manganese. While that situation is desired in making steel, it would be otherwise in producing gray iron castings, and necessitates further treatment with carbonaceous material such as coke and ferroalloys to bring the carbon, silicon, and manganese within the desired range.

Some phosphorus reduction can be accomplished in the basic-lined cupola by use of highly basic and oxidizing slags as in the steelmaking process, but silicon and manganese losses are too high to result in a satisfactory material for gray iron castings.

Other phosphorus reduction methods involve pouring the molten metal into molten slags similar to those mentioned, but again there is a reduction of carbon, silicon, and manganese. For example, in the Perrin process developed in France, the molten iron is poured from a height of about 20 ft into a ladle of molten slag. Slag is composed of 13 parts lime, 7 parts iron ore and 1.5 parts fluorspar. When the molten iron is poured into the slag, a violent reaction occurs, and the phosphorus is reduced rapidly to a suitable level for steelmaking in a few minutes.

In the Yocum process, developed in this country, a powdered cold slag composed of 50 parts lime, 30 parts mill scale, and 20 parts flux is fed into the molten metal stream at the point where it meets the metal level in the ladle.

As indicated these procedures accomplish in a few minutes results which take hours in the normal operation of the usual steelmaking furnaces.

For a discussion on phosphorus reduction we suggest you study "Possibilities of Reducing the Phosphorus Content of Cast Iron" by R. I. Higgins which was published in the August, 1954, issue of the *Journal of Research and Development*, and "Production of Low Phosphorus Foundry Iron from High Phosphorus Iron Ores" by R. I. Higgins and J. C. Billington in the February, 1958, issue of the same publication. The *Journal* is published by the British Cast Iron Research Association, Alvechurch, Birmingham, England.

Casting Surfaces Become Rough

We operate a small bronze, brass, and aluminum foundry producing principally aluminum and manganese bronze castings. Up until a year ago we used Windsor Lock sand, which was very satisfactory. Since then we have not been able to obtain it and have been using 00 Albany sand. This works satisfactorily for about a month and then seems to burn out and the castings become very rough.

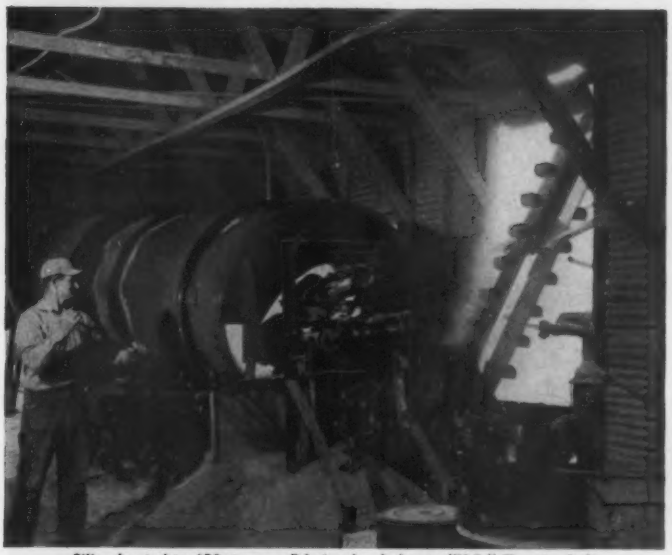
Your experience indicates that something is being overlooked in reprocessing the sand after use. We assume that your practice is similar to that followed in small nonferrous foundries where a few molds are poured, shaken out on the floor, the sand retempered and used again—the cycle continuing through the day. From time to time additions of new sand are made to the various heaps to replace the sand carried away on the castings as well as to replenish the bonding power of the sand.

Possibly you are not adding enough new sand to the heaps, or the new sand is low in clay content. Perhaps the addition of small amounts of southern bentonite or clay might remedy the situation. Again it might be that during shakeout more core sand is entering the sand heaps. The core sand being much coarser than the molding sand will change the grain distribution. That condition can be remedied considerably by larger additions of new sand.

Another possibility is that the sand is not cut over sufficiently during the retempering operation, or that too much moisture is added, and to avoid trouble from blows the molders do not ram the molds hard enough to provide a smooth surface on the castings.

Best procedure to determine why the sand does not serve satisfactorily after a short period is to examine it for grain distribution, green strength, permeability, moisture, etc., in both the original condition and when it no longer gives the desired results. Comparison of the data obtained from the two tests will indicate the cause and how to remedy the situation. If you do not have equipment to carry out the testing of the sand, the work can be done by some commercial laboratory which engages in that field.

HOT MATERIALS ELEVATOR BELT



Silica heated to 450 degrees F being loaded onto "U.S." Elevator belt.

"U.S." Elevator belt carrying hot silica up to and discharging it into chute.

"Terrific heat, terrific weight, high abrasion . . . all combine to severely tax elevator belts. But this U.S. Rubber Belt has been on the job 3 times longer than any belt previously used," says co-owner J. C. Barry of Barry & Barry Sand Co. (Silsbee, Texas) producers of foundry, chemical and specialized sands.

J. C. and J. W. Barry watch the hot silica being funneled into loader equipped with "U.S." loader belt.

"We have two U.S. Rubber elevator belts here," he adds. "We need belts that will last a long time, which means belts that are not bothered by terrific heat (up to 450 degrees F.) terrific weight, plus the abrasive action of sand. So far, each of these belts has outlasted the belts of other makes while showing no signs of wear. *These belts never fail us...no lost production, no downtime.* We are very satisfied. They do our job best."*

It is performance such as this that has made U. S. Rubber the largest manufacturer of conveyor and elevator belts.

• • •

When you think of rubber, think of your "U. S." Distributor. He's your best on-the-spot source of technical aid, quick delivery and quality industrial rubber products.

*This installation was handled by "U. S." Distributor Behring, Inc., Beaumont, Texas.

Mechanical Goods Division

United States Rubber

WORLD'S LARGEST MANUFACTURER OF INDUSTRIAL RUBBER PRODUCTS

Rockefeller Center, New York 20, N.Y. In Canada: Dominion Rubber Company, Ltd.

ONLY 4 RODS IN THIS 2200-LB. CORE ...BUT LOOK AT THE OVERHANG!

The overhang alone on this odd-shaped core was enough to cause a hang-over. But a Pennsylvania foundry solved this problem by using 2% of Houghton's Hy-Ten QUIK-SETT cold-setting binder with a 45-mesh sand.

No ramming was needed, and they saved over 2½ hours per core . . . 20 minutes against a previous half-day. Only 1,000 pounds of sand were mulled at once, yet there were no hardening problems.

Tolerances? Only a ⅛" creep-caused size change would mean a re-make. But the cores were dimensionally perfect.

The moral here? For lower-cost dependable cores . . . use Houghton Hy-Ten QUIK-SETT.

HY-TEN QUIK-SETT CORE BINDERS

. . . products of

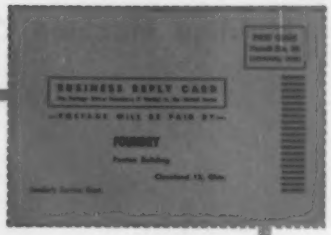
E. F. HOUGHTON & CO.

Ready to give you on-the-job service

Philadelphia, Pa. • Chicago, Ill. • Carrollton, Ga. Detroit, Mich. • San Francisco, Calif. • Toronto, Canada

Circle 611 on Page 53

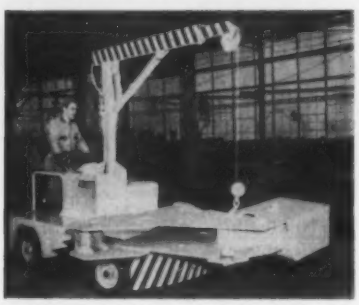
For More Information
Use Reply Card—Page 53



What's New in Equipment and Supplies

TRACTOR CRANE

Model 20RM2 tractor crane, the Go-Devil, is designed for inplant and yard handling of odd-sized or shaped pieces of material. Capacity



is 2000 lb. Fingertip hydraulic control enables the operator to rotate the Rotelift boom 360 degrees continuously, to raise it from horizontal to 75 degrees, and to extend or retract it. Dual-action controls permit simultaneous performance of these operations. Unit is 102 in. long over-all and is 54 in. wide. Platform is 54 x 54 in., and platform space is available independently for truck or stationary mounting. — **Materials Handling Div., Drott Mfg. Corp.**, Wausau, Wis.

For More Details Circle No. 450—Page 53

BENDABLE ALUMINUM ALLOY

Adaptaloy is a new aluminum alloy with unusual properties which include exceptionally high elongation and impact strength and the ability to sustain bending and deformation. No special treatment is required during its casting, and any molding method can be used, except that at present the alloy is not recommended for diecasting. Mechanical properties include the following: Tensile strength, 22-25,000 psi; yield strength, 8-10,000 psi; elongation, 7-11 per cent; Brinell hardness, 48; Charpy impact strength, 4-5 ft-lb notched and 15-20 ft-lb unnotched. It can be anodized. — **American Smelting & Refining Co., Federated Metals Div.**, 120 Broadway, New York 5, N. Y.

For More Details Circle No. 451—Page 53

OPTICAL PYROMETER

Optix optical pyrometer combines all mechanical and optical parts in a telescope-type housing. It is used for temperature measurement of either incandescent or molten iron and steel. An elliptical, floating, luminous index mark for luminosity

comparison is adjusted to disappear easily and quickly, and the temperature is read directly on an 8-in. long ring scale. Small spots can be controlled; at a distance of 3½ ft, an area of about only 3/16 in. is covered. The instrument can be supplied with single, double, and triple range for temperatures to 5430° F. A special "red scale" can be provided for molten iron and steel.—**Epic Inc.**, 154 Nassau St., New York 38, N. Y.

For More Details Circle No. 452—Page 53

CRUCIBLE HAND TRUCK

Unipour hand truck for conveying and pouring crucibles of molten metal can be adapted to handle crucibles from No. 40 to No. 100

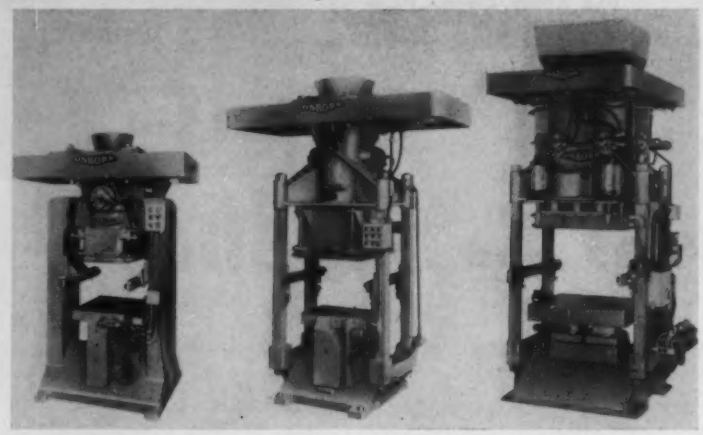
sizes. Raised and lowered pneumatically to adjust to varying pouring conditions, it can be handled easily by one man and used in almost all applications in which two-man shanks are used.—**Morehouse Machine Co.**, 1742 Sixth Ave., York, Pa.

For More Details Circle No. 453—Page 53

RAISED-HUB DISC WHEEL

Bayflex Double-Duty raised-hub disc wheel for portable grinders is designed to cut downtime in welding operations. Two-layer construction permits two different grinding angles so that grinding and finishing operations can be accomplished without changing wheels. Held at an angle of 30-45 degrees to the work surface, the wheel exposes the coarser grained layer for fast stock removal from weld bead. At a 10-20-degree angle, the second layer is brought to bear and produces an excellent finish. The stock-removal layer is available in a single,

Molding Machine Cycle Is under 12 Seconds



Blow-type high-production, automatic molding machines hydraulically squeeze and strip green sand molds in cycle times of less than 12 seconds. Molds reportedly are harder, more accurate, and more uniform than usual, yet production is rapid and low-cost.

These units incorporate a pneumatic blow-fill system and hydraulic squeeze action with choice of flexible diaphragm or rigid squeeze head and extremely compact construction. A predetermined volume of sand is blown into a mold, and blow action assures intimate contact between sand and pattern. The mold then is squeezed to the desired degree of hardness. Density, uniformity, and surface finish of molds is said to be such as to produce superior casting finish. The entire molding operation is automatic, on preset time cycles.

Three models are available, left to right, above, 19-M for small molds; 19-M-2 for medium-sized molds; and 29-M for molds up to 40 x 40 in.—**Osborn Mfg. Co.**, 5401 Hamilton Ave., Cleveland 14, Ohio.

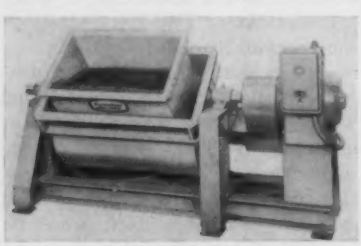
For More Details Circle No. 478—Page 53

standard grit specification and the finishing layer in five different grits for metals from heavy steels through light stainless, aluminum, and copper.—**Bay State Abrasive Products Co.**, Westboro, Mass.

For More Details Circle No. 454—Page 53

VIBRATORY FINISHING

Model VT-75 Vibrasheen deburrs, descales, cleans, burnishes, and surface refines metal parts. The



machine vibrates a 5-cu-ft load of parts and media, using scrubbing action to remove burrs and to finish parts quickly. Because media and parts are in constant vibratory motion, the unit is particularly well suited for fine finishing of delicate parts, heavy burr removal, and finishing parts with hard-to-reach crevices. Large parts can be finished by fixturing them to the container or the framework.—**Almco, Queen Products Div., King-Seeley Corp.**, Albert Lea, Minn.

For More Details Circle No. 455—Page 53

NOZZLE MIX GAS BURNER

Burner was developed for heating processes requiring sealed-in firing with any commercial fuel gas. It offers the application flexibility and advantage of firing with nozzle-mixed gas over a wide range of burner capacity, with exceptional flame stability. Lighting is said to be positive at any burner setting on hot or cold furnaces, kilns, or retorts, and combustion is quiet. High forward velocity of the combustion gases produces greater heat distribution, there is no flashback, and proportioning mixers are not necessary. Performance is satisfactory with normal or excess volume of air or gas.—**Hauck Mfg. Co.**, 124-36 Tenth St., Brooklyn 15, N. Y.

For More Details Circle No. 456—Page 53

DROP STAMP MACHINE

Malleable iron castings warped during annealing can be straightened, sized, and inspected in one operation on the Cecostamp, an air-operated drop stamp which also coins to close tolerances and often eliminates subsequent machining. Tooling simplicity permits economical application of this restrike operation to short runs. Dies usually

are malleable iron with steel inserts where abnormal wear is expected, and simple dies sometimes are fabricated from steel.—**Chambersburg Engineering Co.**, Chambersburg, Pa.

For More Details Circle No. 457—Page 53

CORE PASTE

Super-Korfast core paste is a fine powder which mixes easily with water and incorporates a new principle in adhesive formulation. It is creamy over a wide consistency range, compresses to a thin joint, and is fast drying. Tests have shown tensile strengths for the paste of up to 290 lb. The material can be used for all methods of application and is particularly suited for fixture printing of a paste pattern.—**Foundry Sales Dept., Frederic B. Stevens Inc.**, 1800 18th St., Detroit 16, Mich.

For More Details Circle No. 458—Page 53

PATCH AND PAVE MATERIAL

Tex-Rock is a natural, ground bituminous rock which contains 6.5 per cent Bitumen. It repairs, levels, seals, and smooths any paving, as-

PROOF: B&W Refractories withstand CO and H_2 prepared atmospheres

ATMOSPHERE	APPLICATION	CONSTRUCTION	RESULTS
60% CO	Pusher Type Malleabilizing Furnace	Walls lined with B&W K-23 Insulating Firebrick backed with B&W K-20 IFB. Roof construction—9′-0″ wide sprung arch of B&W K-23 IFB.	No major rebuilding in 21 years.
40% CO	Radiant Tube Annealing Furnaces Malleable Iron Company	Bases lined with 7″ Kaocrete-A, backed with 6″ Kaolite-20. Base size—21′-9¾″ x 9′-9¼″. Temperature 1550 to 1600 F.	In service 11 years. Reducing atmosphere has no effect on the base. All portable annealing furnace bases in plant lined with B&W castables. *Maintenance costs reduced greatly.*
		Bell type covers lined with 9″ B&W K-23 IFB standard shapes in the arch, side and end walls. 13½″ K-23, with Kaowool, is used around the radiant tube openings. Cover is 22′-6″ x 10′-5½″ outside x 8′-4½″ to top of arch.	After approximately 6 years of service, lining showed no disintegration from reducing atmosphere.
65% CO	Radiant Tube Annealing Furnace	Base lined with 5½″ Kaocrete-A and 3½″ Kaolite-20 on top of 5½″ of block insulation. Base size 21′-9″ x 9′-9″. Temperature 1700 F.	Formerly heavy firebrick linings required rebuilding yearly. B&W castable construction has given more than 9 years' service. Customer standardized on B&W castables.
100% N_2 and 100% H_2	Elevator Type Annealing Furnaces Large Steel Co.	Walls lined with 9″ B&W K-23 IFB plus 3″ K-20 IFB. Furnace size 6′-0″ x 16′-0″ x 4′-0″. Temperatures in excess of 2100 F.	B&W refractories show no sign of deterioration in six furnaces of this type in 3 years' operation. Barring mechanical damage, refractories should give long additional service.
100% H_2	Rectangular Hood Type Annealing Furnaces	60 Furnaces, 24 have wall construction consisting of 18″ B&W K-26 IFB plus 2½″ K-1620 IFB. 36 units use wall of 9″ B&W K-26 IFB plus 5″ K-1620 IFB. Furnace size—12′-0″ x 8′-6″. Temperature 2150 F.	Of the 60 covers in service only 2 were rebuilt after 2 years' service. Plant masonry superintendent reports no shrinkage; estimates 15 years' additional life if not for mechanical abuse.

Consult your B&W Refractories Representative for helpful information on your prepared atmosphere problem.

B&W REFRACTORIES PRODUCTS: B&W Alimul Firebrick • B&W 80 Firebrick • B&W Junior Firebrick • B&W Insulating Firebrick • B&W Refractory Castables, Plastics and Mortars • B&W Silicon Carbide • B&W Ramming Mixes • B&W Kaowool

BABCOCK & WILCOX

THE BABCOCK & WILCOX CO.
REFRACTORIES DIVISION
GENERAL OFFICES: 161 EAST 42nd ST., NEW YORK 17, N.Y.
WORKS: AUGUSTA, GA.

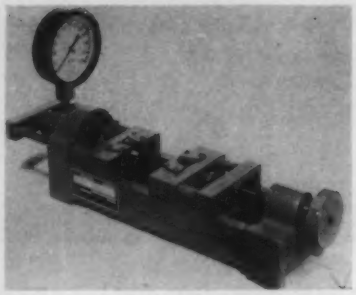
Circle 610 on Page 53

phalt, concrete, or brick surface without mixing or special equipment. Traffic can move over it immediately after application. An adhesive primer is sprayed over the area to be repaired, and the patch and pave material is spread and tamped or rolled level. Tex-Rock can be stored indefinitely and will not freeze. It comes in 100-lb drums with a spray can of the adhesive primer inside.—**Tamms Industries Co.**, 228 N. LaSalle St., Chicago 1, Ill.

For More Details Circle No. 459—Page 53

PORTABLE TENSILE TESTERS

Portable tensile testers for use anywhere on flat or round specimens are not dependent on outside power of any kind. Load is applied manually by rotation of a knurled knob and is measured by a trapped-oil system. Units are available in capacities from 100 to 1000 lb. Ap-

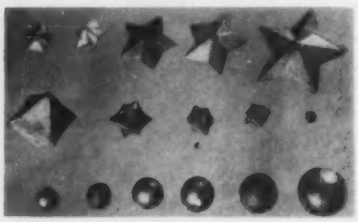


plied load is indicated on a gage 4½-in. in diam. Gage increments are ½ lb on the 100-lb model and 5 lb on the 1000-lb model. Interchangeable, wedge-type jaws hold flat or cylindrical specimens during tests. Jaws in three sizes each cover range of flat specimens up to ⅜ in. thick, and round specimens from ⅛ to ⅝ in. in diam. Maximum length of test specimens is 7 in. Testers weigh 36 lb.—**Steel City Testing Machines Inc.**, 8817 Lyndon Ave., Detroit 38, Mich.

For More Details Circle No. 460—Page 53

ABRASION-RESISTANT METAL

Abmet is an abrasion-resistant metal now available in cleaning stars and grinding balls as well as for special applications. Five and six-point stars cast in sizes from 1 through 3 in. are used for cleaning, deburring, and burnishing metallic parts. Grinding balls in sizes from



¾ through 1¼ in. can be used for burnishing, grinding, or pulverizing of materials. Wear and shock resistance of the metal is said to have made it useful for friction bearings in farm machinery and for other cast parts in abrasive material handling equipment.—**Quincy Foundry Inc.**, Quincy, Ohio.

For More Details Circle No. 461—Page 53

COMPRESSED AIR DRYERS

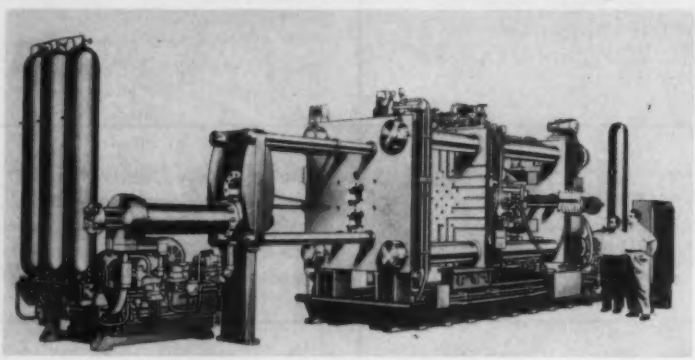
Self-contained, plug-in, compressed air dryers which use refrigeration principles are available in three types. These units deliver a continuous supply of dry compressed air at moisture levels ranging from −50° F dewpoint to −60° F dewpoint as measured at atmospheric pressures. Condensed water is ejected from one of these units automatically and continuously. A novel arrangement of heat exchange surface directs most of the refrigeration capacity to moisture removal.—**Technical Designs Inc.**, 119 Northfield Rd., Bedford, Ohio.

For More Details Circle No. 462—Page 53

CHOP-TYPE METAL SAW

All-purpose chop or swing-type, high-speed metal saw provides 30-hp friction or abrasive cutting and can be used with a grinding wheel. In addition to the 30-hp motor, it incorporates sealed bearing spindle, timing belt drive, and a dynamic suspension system that permits light fingertip feed without springs, counterweights, or adjustments. The

2000-Ton Unit Produces 85-Lb Diecastings



Aluminum diecastings weighing up to 85 lb can be produced with a 2000-ton unit, largest of nine standard-size cold chamber diecasting machines now in the company's line. It is designed for production of castings such as automobile door frames, motor blocks, large housings, and similar parts which would require high locking pressure.

Refinements in clamp and injection ends are said to have resulted in outstanding performance in these machines. They incorporate rugged die toggle mechanism, 18 x 80 x 80-in. platens, and 11-in. tierods which will withstand extreme injection pressures and provide maximum locking pressure to all four corners of the die plate.

The movable platen is guided on bronze bushings and supported on a roller carrier with an eccentric adjustment for height. It rolls on hardened rails to minimize wear and maintain platen alignment. The roller carrier is extended to support heavy dies. Die stroke of the machine is 22 in. minimum to 36 in. maximum. Injection cylinder stroke is from 30 in. minimum to 44 in. maximum, and space between tie bars is 51 in., both vertically and horizontally. — **Cast-Master, H-P-M Div.-Koehring Co.**, 23901 Aurora Rd., Bedford, Ohio.

For More Details Circle No. 479—Page 53

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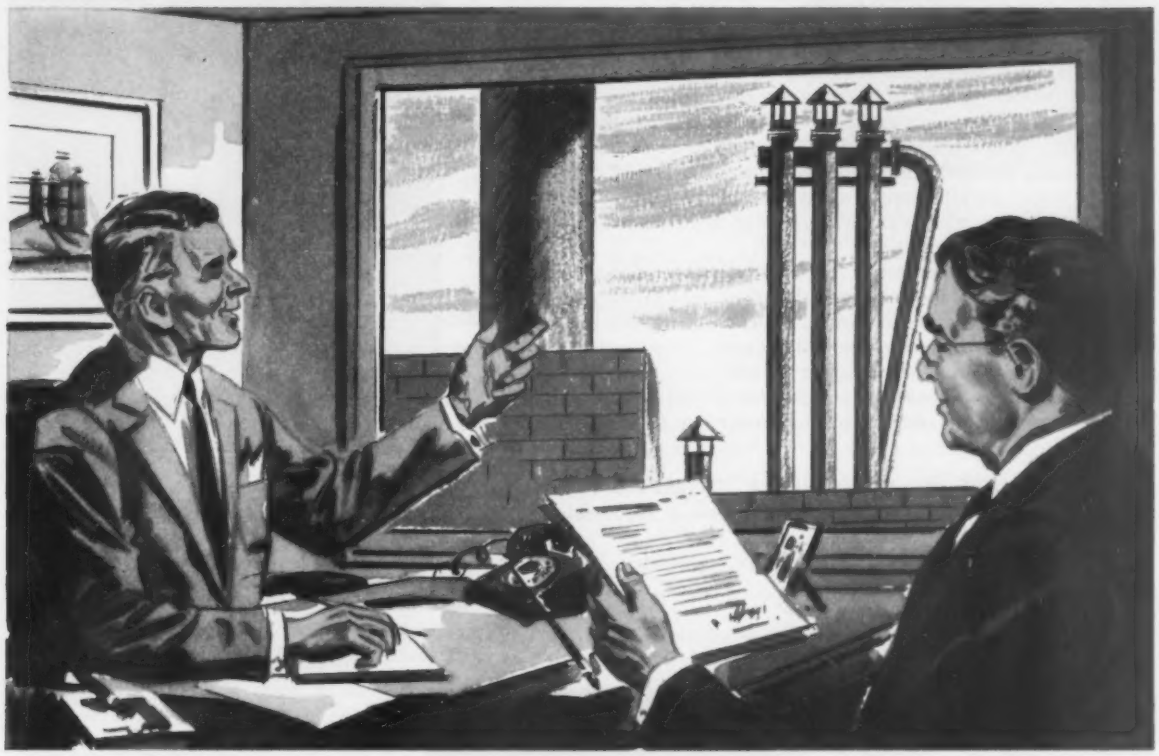
An important message to executives of companies operating foundries...



WHERE CAN YOU INVEST YOUR MONEY BETTER?

In the foundry industry a revolution is taking place. From Connecticut to California commercial foundry executives are making unheard of returns on Brown Hot Blast Heaters for cupolas! Captive foundries, too, are reducing costs to new lows.

An Ohio foundry, for example, added $44,000 to their gross profits in one year.* Management of a Canadian foundry reduced costs $3.50 per ton of castings produced.

What is the cause of such startling profits?

It's a new method of introducing low-cost preheated air into the cupola and accurately controlling its temperature. Briefly, the Brown Hot Blast Cupola Air Preheater reduces the pounds of coke, stone, alloys and metallic loss while permitting greater use of (less costly) steel or cast scrap.

Obtain similar tradition-shattering profits for your own foundry. Have us give an estimate of your own savings without obligation. Send for the Savings Survey Form today.

HEAT EXCHANGE SURFACE
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HEAT TRANSFER PRODUCTS

*From a report by a prominent foundry executive in the Gray Iron News, published by the Gray Iron Founders' Society, Inc.

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Circle 609 on Page 53

FOUNDRY VENTILATION *by* SCHNEIBLE

Features Compensating Air for Building Ventilation Balance

Schneible engineers designed Compensating Air Hoods to provide more and better ventilation in foundries, both summer and winter. The Compensating feature confines air patterns to the immediate work area, thus no drafts to annoy workers or disturbance of building ventilation balance. In summer, hot air can be scavenged from the roof area thus providing more comfortable working conditions. During winter months supply air is taken from outside the building conserving needed plant warm air. In both cases the balance of building air is maintained.

A Schneible Compensating Air Hood System allows complete regulation of all foundry air, with the result that savings are made in power plant operation in winter, while providing the most comfortable working atmosphere in all seasons.

Schneible Uni-flo Compensating Hoods are available for all foundry operations—shakeout, pouring, smoke-off, mold cooling, etc.

Write for bulletin and complete information on Compensating Air Hoods.

CLAUDE B. SCHNEIBLE COMPANY
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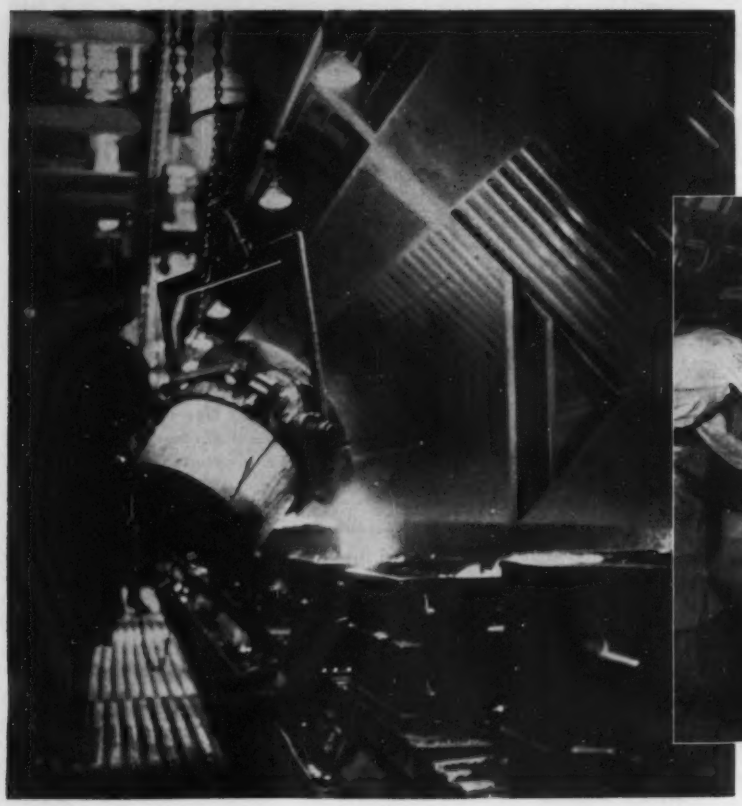
SCHNEIBLE

Refer to Sweet's File No $\frac{1e}{5e}$



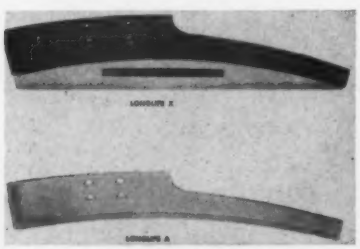
Schneible Uni-flo Compensating Air Hoods in operation on cylinder block line in a large Eastern automotive foundry

machine also provides straight or oscillating feed at the operator's option. Oscillating feed is variable and is said to reduce arc of blade contact, increase blade life and speed of cutting, and make for cleaner abrasive sawing. A guard contains sparks, water spray, or metal chips. Vise handles up to 8 x 8-in. sections or solids.—**Ty-Sa-Man Machine Co.**, 1086 White Ave., Knoxville 1, Tenn.

For More Details Circle No. 463—Page 53

WEAR-RESISTANT PLOWS

Series of carbide-faced plows for replacement service on Simpson mullers are designed to give up to 18 times longer wear than conventional types. These Longlife plows are clad with tungsten carbide blocks at the tips and other high-wear surfaces. They are available



for all of the company's production size series F mullers and can be furnished in two wear grades, A for increased wear in medium abrasive service and X for maximum wear life in highly abrasive service. The X series incorporates additional carbide placed at wear areas. By increasing wear life, these plows reduce maintenance and downtime. — **National Engineering Co.**, 549 W. Washington St., Chicago 6, Ill.

For More Details Circle No. 464—Page 53

ALUMINIZED COATING

Metalsurf is an aluminized coating for decorating and protecting masonry, wood, and metal in a variety of nonfading colors. It reputedly covers previously painted or bare porous surfaces in one application with a metallized finish equivalent to as many as five coats of conventional paint. Formulated with aluminum pigment and long-fiber asbestos, it also fills hairline cracks and other surface imperfections. The coating may be applied indoors or out and is said to resist damage from oil, grease, industrial fumes, and mild acids. Application is with brush, roller, or spray gun. —**Speco Inc.**, 7308 Associate Ave., Cleveland 9, Ohio.

For More Details Circle No. 465—Page 53

PERMEABILITY STANDARD

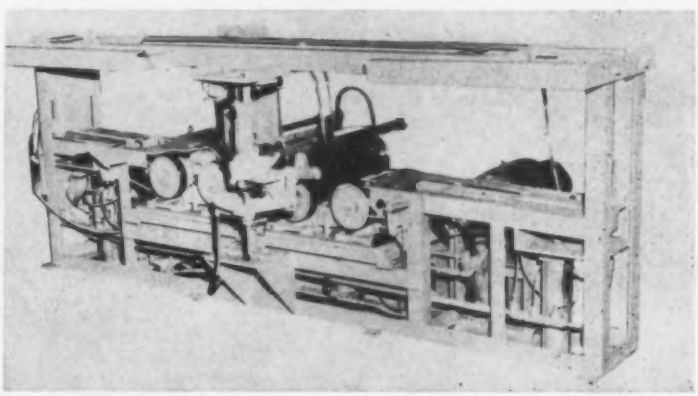
Permeability standard with a sapphire orifice is said to retain its original calibration indefinitely with a minimum of care. The orifice is extremely rugged and is mounted in a rubber stopper which fits any standard specimen tube. The unit can be used to check the accuracy of any of the company's permeability meters with the AFS stopwatch or dial method.—**Harry W. Dietert Co.**, 9330 Roselawn Ave., Detroit 4, Mich.

For More Details Circle No. 466—Page 53

LIFT TRUCK FORK CARRIAGE

A quickly interchangeable standard lift truck fork carriage to increase the versatility of application of the company's tractor shovels can be installed on the Y-18 tractor shovel. Replacement of the bulk handling unit with the pallet handling device requires only the re-

Casts Iron Cylinder Liners Centrifugally



Model ML centrifugal casting machine is designed primarily for production of cast iron cylinder liners. It can produce all usual sizes of liners used in tractors and in diesel, industrial, stationary, and similar types of engines. Although the unit uses metal molds, Type A graphite cast iron can be produced because of the methods used to reduce the solidification rate.

With a 1½-minute cycle, the production rate is 45 castings per hour. The machine is automatic in almost all operations, and one man can operate at least two units. Services of the operator are required to remove and replace the end plate on the mold after each cast so that the casting can be vibrated from the mold. Movement of the mold from one position to the next is completely automatic. The operator simply operates the handle which pours metal into the mold.—**Centrifugal Casting Machine Co.**, P. O. Box 947, Tulsa, Okla.

For More Details Circle No. 480—Page 53

At Speakman Company...

OSBORN 716-

with automatic controls molds cope and drag simultaneously ...and in half the time

Osborn 716-PVA Automatic Vibrating Squeeze Pin Lift Molding Machine frees operator to set cores during machine molding cycle

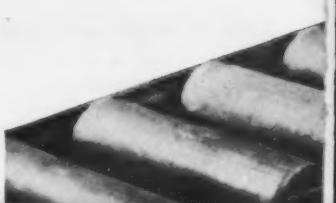
Using the Osborn 716-PVA, a wide range of molds now produced with matchplate patterns can be made with even greater economy. Field reports show one man and the 716-PVA produce approximately twice as many molds per hour. The reports also show better quality finish on castings and less scrap. Operators also prefer the 716-PVA molding procedure because less manual effort is required. Here's why:

To simplify simultaneous cope and drag molding, the operator pushes a button, initiating the automatic molding cycle. During the cycle, in which both a cope and drag are produced at one time, the operator sets cores in a previously made drag.

As the 716-PVA completes its cycle, the cope and drag halves are stripped automatically and remain at rest on the lifting frame. The operator picks off the cope, places it over the cored drag of the previous cycle. After pushing the complete mold onto the conveyor, the operator removes the next drag from the PVA machine. Flasks are placed on the machine, the flasks are filled with sand and the next automatic molding cycle initiated.

A study of your operations could show savings like these in your molding department. Call *The Osborn Manufacturing Company, 5401 Hamilton Ave., Cleveland 14, Ohio.*

AT SPEAKMAN COMPANY, WILMINGTON, DELAWARE, *quality molds for brass plumbing fixtures are produced efficiently on preset time cycles with Osborn's automatic controlled 716-PVA Vibrating Squeeze Pin Lift Molding Machines.*



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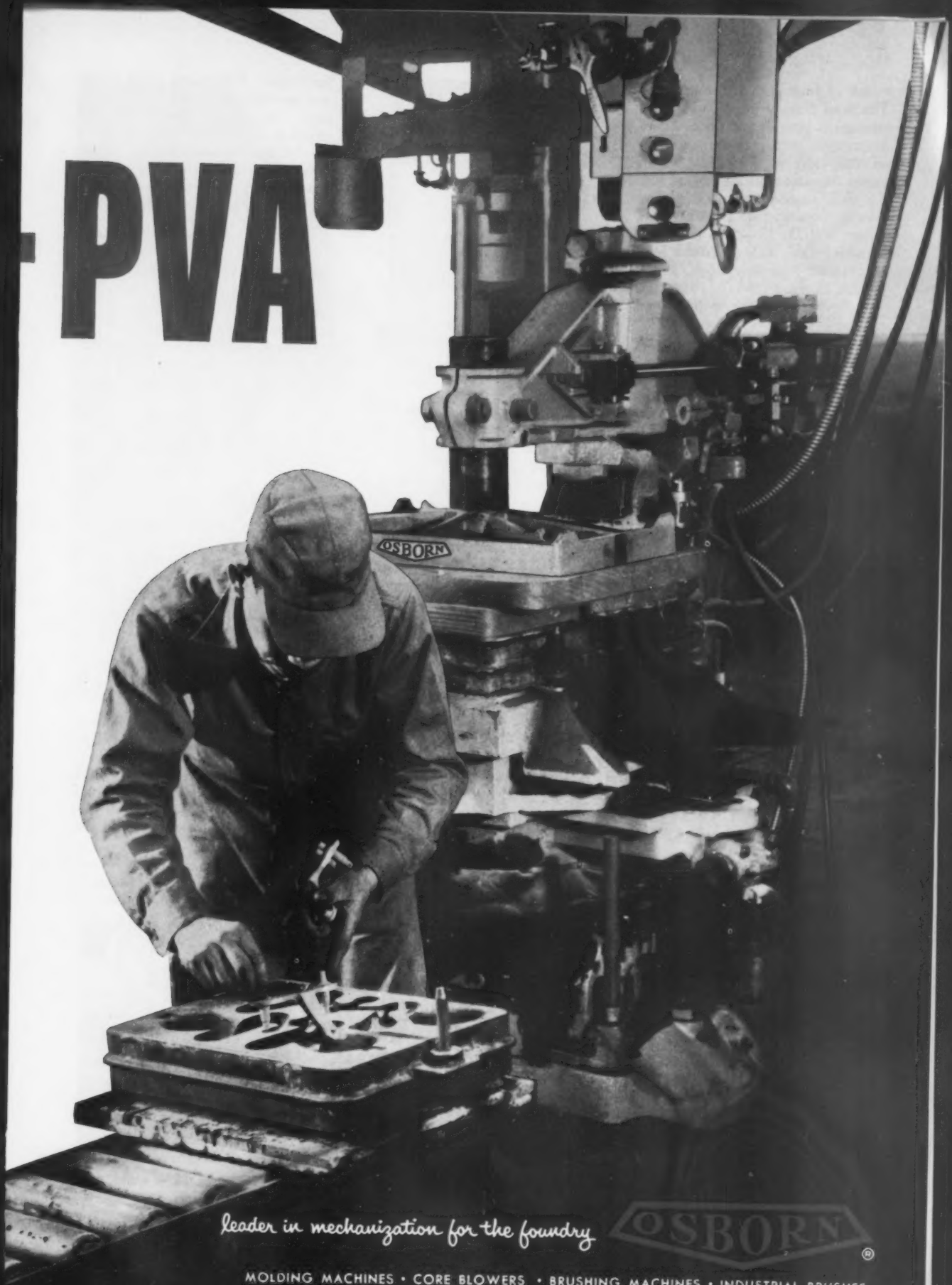
PVA



leader in mechanization for the foundry

OSBORN®

MOLDING MACHINES • CORE BLOWERS • BRUSHING MACHINES • INDUSTRIAL BRUSHES

moval of four pins and four bolts. The front plate of the tractor shovel carriage is built to Industrial Truck Association standards for carriages on 2000 and 3000-lb capacity lift trucks. Maximum lifting height with the fork attachment is 92 in. Operating capacity at a 24-in. load center is 1500 lb.—**Yale Materials Handling Div., Yale & Towne Mfg. Co.**, 11000 Roosevelt Blvd., Philadelphia 15, Pa.

For More Details Circle No. 467—Page 53

LEVER-OPERATED HOISTS

Tugit line of tool-box size, lever-operated hoists has been expanded to include five models covering a capacity range through 3 tons. The line now is composed of ¾, 1, 1½, 2, and 3-ton models. They are built like a hoist, with gearing and load brake instead of long ratchet

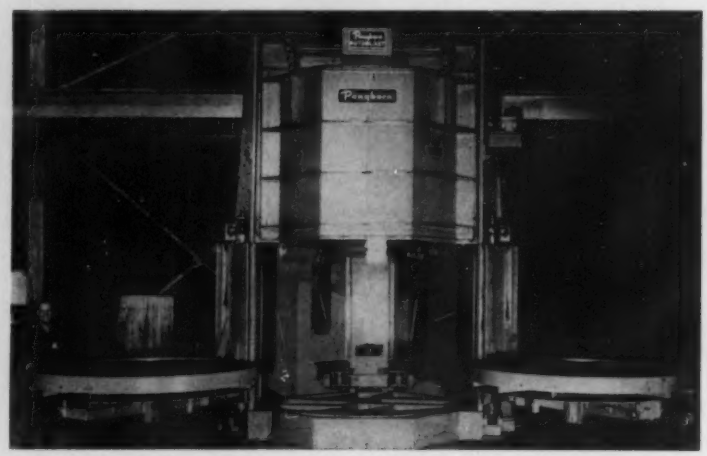
lever and pawl. They can be operated in extremely close quarters and permit accurate load spotting.

Gearing and load brake are totally enclosed in an aluminum alloy frame. Upper and lower hooks are nonfracturing and full swiveling. Link-type alloy steel load chain is designed for hoisting service. A built-in free-wheeling device aids in quick positioning of the lower hook.—**Manning, Maxwell & Moore Inc.**, Muskegon, Mich.

Add Cut

For More Details Circle No. 468—Page 53

Twin-Table Blast Cabinet Cleans 5-Ton Parts



Twin-table Rotoblast room with 8-ft-high capacity cleans individual castings weighing up to 5 tons. As one table load is cleaned, the other table can be loaded, turned, or unloaded. An air clamp locks the table inside the cabinet and kicks it out when released. The operator need only walk with the table to keep it moving until it is latched in the out position.

The unit features two wheels with 30-hp motors capable of throwing 100,000 lb of abrasive per hour. One is mounted on the top deck of the room, blasting 90 degrees to the tabletop, and the second is positioned to provide thorough cleaning of top and sides of the work. Workpieces up to 8 ft in diam and 3 ft 6 in. high can be accommodated on the table.

Spent abrasive is removed by a scraper at the bottom of the blast cabinet into a trough where a 10-in.-diam screw conveyor moves it to a rotating scalping drum for removal of foreign materials. Abrasive is discharged into an elevator boot and raised to the abrasive separator for cleaning and recycling.—**Pangborn Corp.**, Hagerstown, Md.

For More Details Circle No. 481—Page 53

REVERBERATORY FURNACE

Sklenar reverberatory furnace is said to make possible significant reductions in the time and cost necessary to melt gray iron, copper, bronze, brass, aluminum, and other alloys and to have excellent adaptability to melting of ductile iron. Design innovations produce hot metal quickly at savings in fuel and labor, and other features are claimed to provide flexible operation, controlled metal analyses, and re-use of flask equipment and molding floors. The unit permits quick single or successive heats, provides for switching from oil to gas in seconds, and employs a newly developed automatic flame control regulator to balance the fuel-air ratio. —**U. S. Smelting Furnace Co.**, Belleville, Ill.

For More Details Circle No. 469—Page 53

FLAME-CUTTING NOZZLES

Improved flame-cutting nozzles for use with acetylene or fuel gas include bendable nozzles for riser removal and nozzles for fin washing, general duty cutting, and high-speed, mechanized shape cutting. Series 1534 and 1535 Oxweld two-piece nozzles for use with natural gas have 12 to 20 extremely small outlets for preheat gases and are said to increase cutting speeds. Ox-

weld 1523 and 1524 series nozzles reportedly double rate of metal removal in fin-washing operations. The 1540 series bendable nozzles

Tough, Durable Cores

every time with

Foundrez Resin Core Binders

Photos taken at Florence Pipe Foundry & Machine Co., Florence, N. J.

Volume production of heavy castings demands that the cores used by Florence Pipe Foundry & Machine Company stand up under rough handling. Florence secures the high tensile strength and hardness needed in these cores by using RCI FOUNDREZ 7100 series resin binders in their molding sand.

These water dispersible phenol-formaldehyde core binders are especially formulated for use where baking time is at a premium. In addition they possess higher hot strength and slower collapsibility than either core oils or urea-formaldehyde binders.

These resins are used in conventional core sand mixtures containing cereal binders and water. Only half as much FOUNDREZ as regular core oil is required to produce equivalent core handleability. Reichhold's FOUNDREZ 7100 series includes:

Foundrez 7101 — a high solids binder compounded for foundries where core gas is a problem. Extremely effective in producing cores with high strength and hardness.

Foundrez 7102 — formulated for very rapid baking schedules, this binder provides excellent green strength with a minimum of cereal binder.

Foundrez 7103 — features easy collapsibility and a low viscosity which permits ready mixing.

Foundrez 7104 — combines a high degree of stability with high tensile strength. Resultant cores are extremely moisture resistant — may be stored for long periods without fear of moisture pickup.

For complete technical data on the FOUNDREZ 7100 line write Reichhold — ask for Bulletin F-1-R.

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REICHHOLD CHEMICALS, INC., RCI BUILDING, WHITE PLAINS, N. Y.

Circle 614 on Page 53

are for riser removal and cutting in hard-to-reach spots.—**Linde Co.**, division of Union Carbide Corp., 30 E. 42nd St., New York 17, N. Y.

For More Details Circle No. 470—Page 53

BANDSAW

A 20-in. bandsaw for cutting materials ranging from stainless steel to aluminum, wood, and plas-

tics features a variable-speed drive which provides a speed range of 50 to 4500 fpm. The exact speed for an operation is set by turns of a handwheel. Blade guides provide accurate, straight cuts and up to 100 per cent more blade life. The top guide supports the blade down to the top surface of the workpiece, and the lower guide supports it to within 13/16 in. of the lower surface. Other features provide durability, convenience, and accurate operation.—**Rockwell Mfg. Co., Delta Power Tool Div.**, 455 N. Lexington Ave., Pittsburgh 8, Pa.

For More Details Circle No. 471—Page 53

REFRACTORY METALS

Non-Oxo-Pak is a system of packaging refractory metals under inert gas in hermetically sealed containers. Vacuum melting grade molybdenum and tungsten rondelles now are available, in 25 and 50-lb packages respectively. Contents will not oxidize so long as the airtight seal remains intact.

In addition to eliminating moisture and oxygen pickup, the containers facilitate rapid weighing of charges and are easy to move, store, and inventory. Other refractory metal products also can be obtained in these packages if so ordered. They include tungsten and molybdenum powders and granules, titanium wafers, zirconium wafers, and others.—**Metals & Residues Inc.**, 65 Brown Ave., P. O. Box 92, Springfield, N. J.

For More Details Circle No. 472—Page 53

TRACTOR-LOADER

Work Bull 406 tractor-loader features instant no-shift reversing, a torque converter, and five equal speeds in either direction. Foot pedals control direction and rate of speed, and the torque converter adjusts speed to load requirements. Power steering and good visibility facilitate operation of the unit.

In use, the 406 offers direct-line thrust for bulldozer-type action, and telescoping lift arms permit a lift height of 126 in. at the hinge point. Bucket payload is 7/8 cu yd, and struck capacity is 2/3 cu yd. Any model of Davis loader attaches directly to the unit in less than five minutes. Attachments include a pickup sweeper, rotary broom, angle dozer, fork lift, and swinging crane.—**Massey-Ferguson Industrial Div.**, 1009 S. West St., Wichita, Kans.

For More Details Circle No. 473—Page 53

PHOTOELECTRIC CONTROL

Relatively high-speed photoelectric operation without tubes reportedly is provided by a control utilizing a cad cell sensing element with magnetic amplifier. The control requires 10 foot candles minimum light with 0.04 second minimum dark time and 0.04 second light

time. The control relay energizes when light is on the cad cell sensing element. Housing is cast aluminum with splashproof gasket seal, tapped for 1/2-in. conduit. Power consumption is 5 watts, and lens diameter is 1 1/2 in. Dimensions are 7 1/4 x 6 1/2 x 5 1/2 in.—**Autotron Inc.**, P. O. Box 722R, Danville, Ill.

For More Details Circle No. 474—Page 53

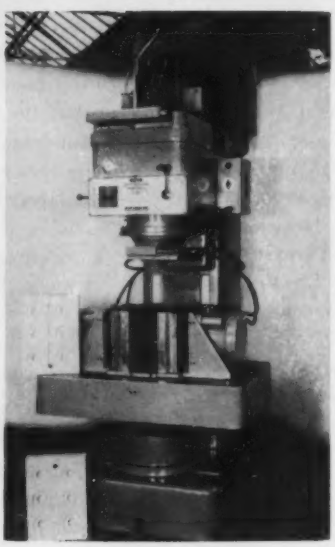
BELT CONVEYOR IDLER

Spiral-shaped rubber idler for belt conveyors to handle bulk materials is made of tough synthetic rubber molded around a wire rope. Constant flexing from end to end prevents buildup of wet, sticky materials, and flexibility enables it to conform readily to variations in belt load. Mounting brackets on either end permit free pivot in the

Machine Shoots, CO_2-Gasses, Strips Mold

Mold shooter for stack molds shoots mold, gasses it with CO_2, strips it, and reloads with sand. Control is by one master valve which is said always to work in the correct sequence. In some instances, two molds can be shot at the same time with use of a middle partition. Gassing cycle is adjustable, the machine uses little space, and it is fast. Control is completely by air, without solenoids. The movable shootplate automatically closes the sand reservoir during the gassing cycle and acts as a gassing plate. Models are available with either 42 or 88-lb sand capacity.—**Hansberg Shooters Inc.**, 3213 Central St., Evanston, Ill.

For More Details Circle No. 482—Page 53



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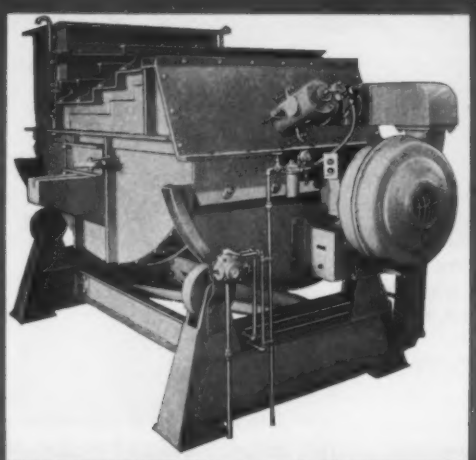
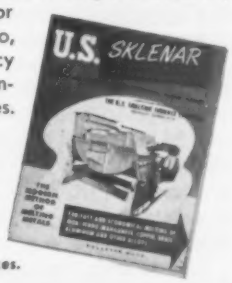


U. S. "SKLENAR" REVERBERATORY FURNACE

It's Tomorrow's Method of Melting Metals . . . *TODAY*

A significant reduction in the time and cost of melting gray iron, ductile iron, copper, bronze, brass, aluminum and other alloys can now be yours with the new, improved U. S. "Sklenar" Reverberatory Melting Furnace. Particularly marked are its outstanding qualifications for the production of ductile iron. The latest, most efficient unit available today, the design of its internal contour, charging hopper, roof assemblies and its other innovations, results in hot metal in a shorter period of time at drastic savings in fuel and labor.

Designed, produced and field-tested by practical foundry engineers, exclusive features of the U. S. "Sklenar" Furnace include: ruggedly designed to withstand hard foundry use, quick single or successive heats, provision for switching from oil to gas in seconds, new Automatic Flame Control Regulator (Patent Pending) for balanced fuel-air ratio, increased melting speed, greater efficiency of operation, longer lining life, low maintenance and a host of other plus values.



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- Greater flexibility.
- Controlled analysis of metals.
- Re-use of flask equipment and molding floors throughout the day . . . permits uninterrupted molding.
- Minimum of labor required . . . all labor fully utilized.
- Lower maintenance cost.
- Improved Automatic Furnace Atmospheric Control (Patent Pending).
- Speedy removal and replacement of hopper end and roof sections for inspection and lining repair.
- Unexcelled adaptability for producing ductile iron.
- And . . . the know-how acquired by over four decades of solid and successful experience.

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Circle 615 on Page 53

vertical plane. The idler hangs naturally and conforms readily to off-center loads.

Seals prevent intrusion of dirt into moving parts, and torsional strength which results from the continuous rubber spiral is said to insure long life. Replacement is accomplished by lifting out worn idlers and dropping in new ones. Idlers are available for belts 18, 24, 30 and 36 in. wide.—**Hewitt-Robins Inc.**, 666 Glenbrook Rd., Stamford, Conn.

For More Details Circle No. 475—Page 53

RESIN POWDER BINDER

Admirez UP-15 is a compounded urea resin powder binder of particular interest to producers of malleable, lightweight gray iron, aluminum, magnesium, brass, and bronze castings. Developed for conventional or dielectrically baked cores, it offers high collapsibility, excellent green strength, lack of stickiness, and fast baking. Storage life is more than one year. A built-in color indicator helps to determine length of mixing cycle, and sand coated with the resin can be either blown or rammed. Gas evolution and objectionable odor are negligible. — **Archer-Daniels-Midland Co., Federal Foundry Supply Div.**, 2191 W. 110th St., Cleveland 2, Ohio.

For More Details Circle No. 476—Page 53

VACUUM FURNACE

High-vacuum resistance furnace operates at temperatures as high as 4400° F and has hot-zone capacity to handle production work. Furnace chamber, pumping system, power supply, and controls are in one cabinet, and the unit can be operated at absolute pressures of 10^{-5} mm of mercury or under inert atmospheres.

The furnace is of the internal element type and has a heating unit approximately 6 in. in diam and 10 in. high. It heats in about six minutes and cools in 20. A counterweighted, full-diameter cover provides access to the entire interior.

All controls, including a strip chart recorder available as optional equipment, are mounted on a panel at the back of the cabinet. The entire system is designed for fail-safe operation, and positive temperature safety controls make it impossible to open the furnace until safe temperatures are reached.—**NRC Equipment Corp.**, 160 Charlemont St., Newton 61, Mass.

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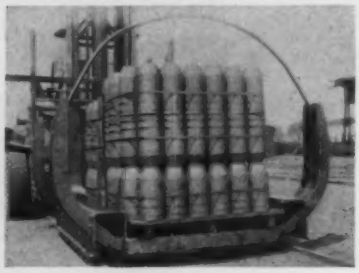
REFRACTORY LADLE NOZZLES

Refractory ladle nozzles which are pressure impregnated with coal tar pitch are said to provide production



economies and an improved end product. Manufacturer claims that bore erosion is reduced to a uniform minimum, less refractory is included in metal, and control of pouring streams is easier. In addition, these nozzles are reported to provide better resistance to thermal shock, substantially reduce the number of runners, leakers, and drippers, and to eliminate formation of icicles or chills.—**Wood Preserving Div., Koppers Co.**, Pittsburgh 19, Pa.

For More Details Circle No. 485—Page 53

PLASTIC-COATED GLOVES

Plastic-coated Plastifab gloves feature nonslip wet and dry grip. Coated with a blend of plastic resins and plasticizers to provide abrasion resistance, flexibility, and long wear, they are completely liquid-proof and are said to stand up under

extremes of severe service. Six models are available in a choice of full or partial coatings. There are no seams across knuckles or other areas to irritate hands, and wing thumb, fingers, and palm are curved to form natural contours. Gloves come in knitwrist, band top, or gauntlet styles and in various lengths. All gloves have 8-oz jersey lining.—**American Optical Co., Safety Products Div.**, Southbridge, Mass.

For More Details Circle No. 486—Page 53

GRINDERS

Extra heavy duty grinders are available in ½, ¾, and 1 hp models. Cast iron tool rests are adjustable for height, angle, and distance from wheel. Extended frame construction permits grinding of large, oddly shaped parts. Wheel guards are drilled for eyeshields and have exhaust outlets and spark shields. Full ball bearing construction is lubricated for life. These units have capacitor start and induction-

type motors. Pedestal constructed of heavy-gage welded steel is for use with the grinders.—**Stanley Electric Tool Div., Stanley Works**, New Britain, Conn.

For More Details Circle No. 487—Page 53

HYDRAULIC PRESSES

Company's line of four-column, single-action hydraulic presses has been modernized and expanded to include 48 standard models, either up-acting or down-acting, which cover a range from 25 through 1000 tons. Because frame construction permits access to the working area from every direction, these presses can be fed from front, back, or either side. Crown, bed, and sliding platen are claimed to provide maximum resistance to deflection. All models can be fitted with manual lever or electric pushbutton controls for single or continuous cycling.—**K. R. Wilson Inc.**, Arcade, N. Y.

For More Details Circle No. 488—Page 53

valuable asset: RESEARCH

One of Semet-Solvay's most valuable assets is its recently expanded research facilities at Ashland, Ky. The uniformity and high quality of our Foundry Coke is directly attributable to the constant research vigilance exercised in every phase of production from mine to finished product. Here at Ashland, in a coke test oven the measurable qualities of our coking coals are quickly ascertained and mixes adjusted to insure a uniform high quality.

No pygmy this pilot plant test oven, but a large capacity unit taking a 700-pound charge. The large size makes certain there will be no loss of accuracy in the interpretation of results because of too much scaling down. Thus the coal charge and the setting of standards for full-scale operation, as determined by testing, are thoroughly reliable.

Plans for the future call for a program of continued use of the pilot plant so that the cokes continually improve in uniformity.

In addition to the high quality of the product, which stems from continuous research, the purchase of your Foundry Coke from Semet-Solvay has many other advantages: Semet-Solvay plants and coal mines are strategically located to serve you. Availability is constant, thanks to Semet-Solvay's extensive productive facilities. Five coke sizes are available to meet the requirements of all sized cupolas and melting practices. And last but not least, we offer advice—a free metallurgical service department staffed by specialized technicians. Their advice is yours for the asking.

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Circle 616 on Page 53

By VICTOR M. ROWELL
Vice President
Harry W. Dietert Co.
Detroit

Developments in Testing

STEEL MOLDING SAND

TABLE I—Screen Analyses of Two Test Sands

Retained on Screen	Narrow Distribution Sand	Broad Distribution Sand	Composition of Broad Distribution Sand	
			80%	20%
30	....	1.2%	1.6%	....
40	....	12.1	15.2	....
50	1.2%	21.7	27.4	....
70	30.0	19.6	24.6	0.2%
100	52.4	15.5	18.6	3.8
140	13.8	15.8	9.0	41.6
200	2.2	9.9	2.8	36.4
270	0.4	3.1	0.4	14.0
pan	....	1.1	0.4	4.0
Grain Finess Number	70	74	56	133

● YEARS AGO, the universally preferred type of steel molding sand was based on a rather coarse grained, highly refractory silica sand to which silica flour was added to lessen penetration and promote peel. In some local areas, there has been a certain amount of agitation against the use of silica flour despite the fact that it has been, and is, a useful material for steel sands.

The old practice of coarse sand and silica flour was intended partly to promote high density so that the metal would not penetrate the mold surface. Investigations conducted by members of the Basic Concepts Committee of the AFS Sand Division have shown that this approach is correct fundamentally.

Trend Is to Finer Sands—Within the last ten years, there has been a trend toward the use of finer, more stable sands for all cast metals to promote production of more accurate castings with better finish. However, studies have established the fact that when sand of uniform particle size is used, the finer the grain, the less the density.

Work of the committee members has dealt with a comparison of two types of base sands, differing considerably in grain distribution as shown in Table I. Six different mixes of these base sands, containing 5 per cent western bentonite, 5 per cent western bentonite and 1 per cent cereal, or 5 per cent western bentonite and 10 per cent silica flour were studied. The mixes and properties obtained with each are shown in Table II.

Certain trends stand out in comparing properties of the mixes. Density, assuming application of constant ramming energy, is higher in all cases for the broad grain distribution sand mixes. Cereal content, as shown, reduces density slightly due to impairment of flowability. As might be expected, permeability decreases as density increases. Generally, these two factors are inversely proportional. The one exception is that the narrow distribution sand with cereal shows a little higher permeability than might be expected from the density. Green compression strengths, in all cases, were higher with the broad grain distribution sand.

Deformation is dependent, as are all other properties, on moisture level, but at a normal workable level it became somewhat higher with the cereal mix. Grain distribution has little, if any, effect on green deformation.

Surprises in Tensiles—Some surprises show up in green tensile strength properties. In all cases the broad grain distribution sand mixes showed higher green tensile strengths than the narrow distribution sands. It is interesting to note that both base sands when mixed only with the bentonite had the highest strengths. It is possible that this may not hold true at all moisture levels, but the distinct advantage of the broad grain distribution is worthwhile. Green tensile strength testing has been neglected, although this undoubtedly is an important property to be considered. New easy-to-operate equipment with good accuracy may result in popularization of this test.

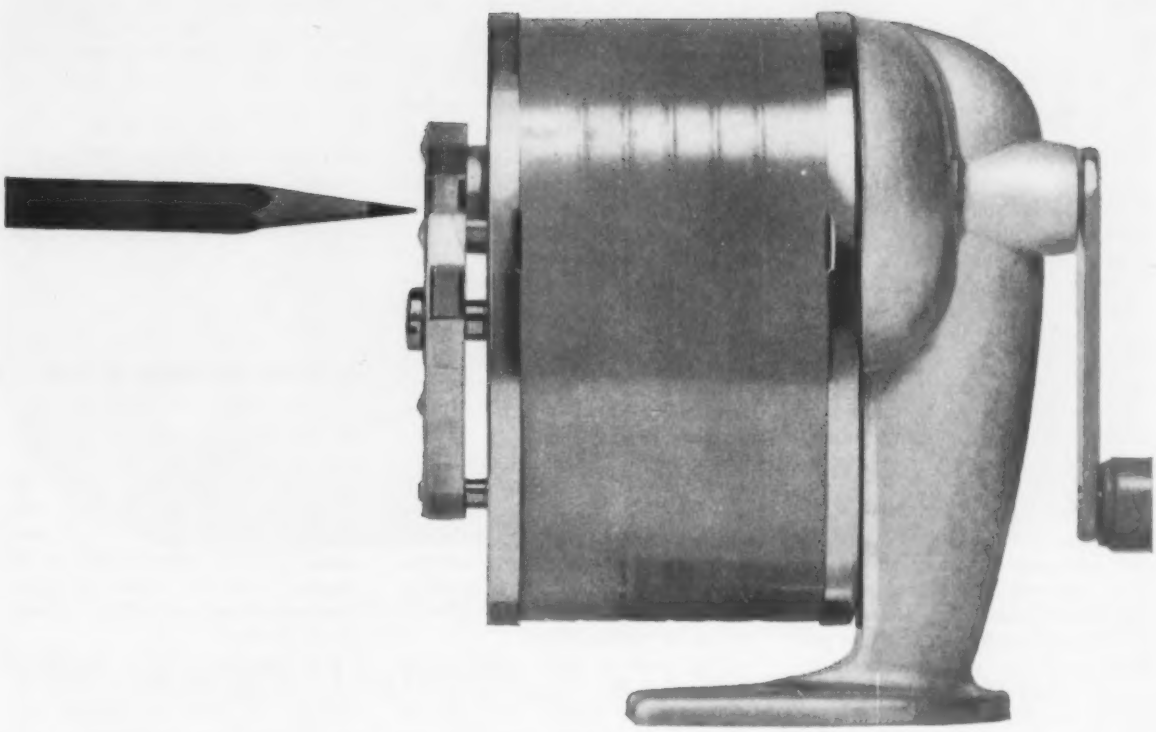
Although dry compressive strength is enhanced somewhat by the addition of cereal, the highest values were reached with the base sands containing silica flour. Dry compressive strength does not follow the density trend except for the fact that the broad grain distribution sand in all cases produced higher dry strengths than did the narrow distribution sand.

Hollow confined expansion at 1500° F was reduced noticeably in both base sands by the addition of cereal. Expansion was approxi-

TABLE II—Mixes and Properties of Sands Used for Study

	Sand Mixes					
Broad distribution sand, %	95.0	....	94.0	....	85.0	....
Narrow distribution sand, %	....	95.0	....	94.0	....	85.0
Western bentonite, %	5.0	5.0	5.0	5.0	5.0	5.0
Cereal, %	....	....	1.0	1.0	....	....
Silica flour, %	....	....	....	....	10.0	10.0
	Properties					
Moisture, %	2.9	2.8	3.6	3.6	3.5	3.5
Density, lb/cu ft	101.85	95.25	97.5	93.15	103.75	97.7
2 x 2-in. specimen wt, grams	168.5	158.0	161.0	154.0	171.0	162.0
Green permeability	69.7	100 5	109.7	116.0	58.9	80.3
Green comp str, psi	8.08	6.6	7.5	7.2	8.1	6.1
Green def, in./in.	0.0187	0.0176	0.0274	0.0282	0.0207	0.0202
Green ten str, oz/sq in.	18.8	12.7	13.1	11.4	14.0	10.5
Dry comp str, psi	117.0	98.4	153.7	96.3	167.1	117.0
Hot comp str @ 2000°F, psi	303.0	230.0	210.0	135.0	610.0	383.0
Hot def @ 2000°F, in./in.	0.0588	0.0573	0.0670	0.0770	0.0493	0.0440
Hot comp str @ 2500°F, psi	14.0	9.0	14.0	10.0	30.0	16.0
Hot def @ 2500°F, in./in.	0.1100	0.1080	0.0460	0.0460	0.0645	0.0670
Hollow confined expansion @ 1500°F, in./in.	0.0284	0.0272	0.0187	0.0160	0.0271	0.0262
Restraining load—1800°F, psi	80.0	58.5	30.0	33.3	76.3	63.3
Mold hardness	85.0	87.0	83.0	87.0	88.0	85.0

Mulling time: 2 minutes dry, 5 minutes wet



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7. Wide temperature range
8. Polymerized formulation
9. Minimum gas
10. Ample collapsibility

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Circle 617 on Page 53

mately the same in other sand mixes of either type distribution. Hot strengths at 2000 and 2500° F were higher in all broad distribution sand mixes. Highest levels were reached with silica flour additions, and lowest values were in the mix containing cereal. It is interesting to note that the hot strength at 2500° F of the narrow distribution sand plus silica flour was practically the same as the broad distribution sands without silica flour.

Glazing Is Important — Hot deformation at 2500° F indicates how mold surface glazing is being approached. Glazing is advantageous from a peel standpoint, provided that actual fusion is not encountered. The highest order of hot deformation or plasticity at that temperature was achieved with the sand mix containing only bentonite. Practically no difference existed between narrow or broad distribution sands. The most brittle sands were those containing cereal; probably the carbon present tended to inhibit glazing.

The restraining load test involves maintaining the original length of the specimen by progressively applied pressure as the sand expands. This stimulates the forces at work at the mold surface, tending to produce scabbing, and has been accepted as an AFS Tentative Standard to predict scabbing tendencies. For this test, the ramming energy was varied enough to hold the mold hardness at a nearly constant level of 83-87. The lowest restraining load figure was obtained with the cereal mix. The presence or absence of silica flour made little difference in the restraining load value.

A simple, fast shock test for determining cracking or spalling tendencies of a sand mix involves placing a rammed specimen of sand in a dilatometer furnace at 2600° F and visually observing its behavior after 30 seconds. This is a qualitative test and provides no numerical values. A reasonable assumption is that the more a sand cracks or spalls within the first half minute or so, the more trouble may be expected due to mold wall instability at high temperatures. The mixes with broad grain distribution showed better stability than did those with narrow distribution. The best sand mixes in this test series appeared to be those containing cereal, and the worst were those containing silica flour.

Summary—The broad grain distribution sand seems to be highest in density, green compressive strength, green tensile strength, dry compressive strength, hot strength, and glazing ability. It is superior in spalling resistance. It also is lowest in permeability.

The narrow grain distribution with cereal has the highest permeability, lowest density, dry and hot strengths, and fell between the other two narrow distribution mixes in other properties. The narrow distribution sand with silica flour is lowest in green compressive and tensile strengths, poor in glazing characteristics, and exhibits the worst appearance on exposure to thermal shock.

Arguments still can be advanced for each type of grain distribution. Results of this study favor a broad grain distribution sand, which minimizes the need for a silica flour addition. However, the broad distribution sand, in the dry state, requires care to avoid grain segregation. The blending of two sands to achieve the desired distribution patterns is more practical than attempting to find one sand possessing the broad range of grain sizes.

Editor's Note: This article is based on a paper presented at the AFS Wisconsin Regional Foundry Conference in Milwaukee, February, 1959.

SCHOLARSHIPS: Certificates were presented to students holding Foundry Educational Foundation scholarships at Pennsylvania State University during a spring meeting there of the school's Industry Committee. Shown at the meeting, left to right, are Stanley Platek, Myron Carpenter, John Koop, Prof. B. W. Niebel (department head), W. B. Wallis (committee chairman), Thomas Gorsky, and Mark Paterno. Several other scholarship students were unable to be present

Publishes Diecasting Manual

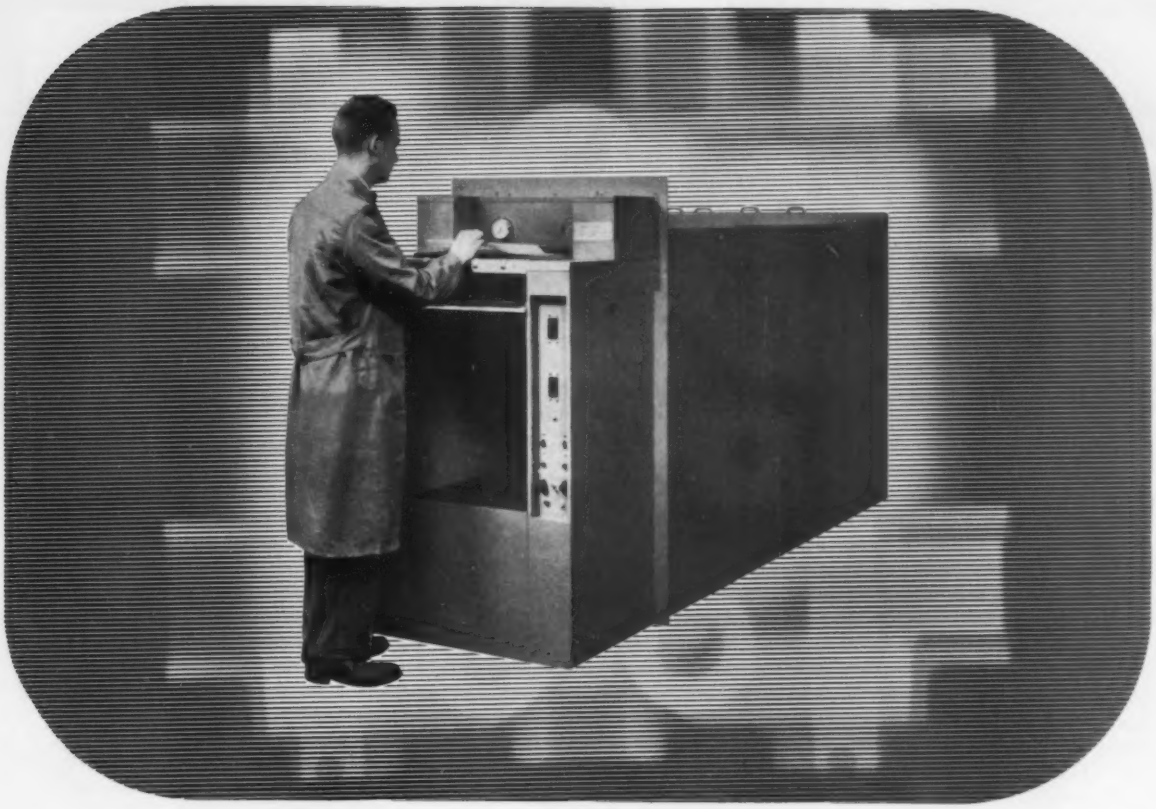
A new 450-page technical manual for the diecasting industry has been published by the American Charcoal Co., 201 South Green St., Detroit 17. Entitled "A Visit with 500 Diecasters," the manual contains technical information on all phases of modern diecasting practice contributed by leading authorities in the field.

The manual will be distributed to all contributors and certain diecasting companies. Additional copies are available at $10 each.

Book Review

Insurance Costs and Controls: A Reappraisal, **AMA Management Report No. 19, prepared by the Insurance Division, cloth, 138 pages, 6 x 9 in., published by the American Management Association, 1515 Broadway, New York 36. Price, $3.75.**

This report presents information on new ways to cut company insurance costs. It shows how the insurance manager can reduce expenses without affecting coverage, and how to integrate insurance economies with over-all cost reduction. Ways of lowering the cost of special coverages (unemployment compensation, business interruption insurance, credit insurance, etc.) also are considered. Current federal and state legislation affecting insurance costs and coverages are discussed.



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Industry Briefs

International Harvester Co., Chicago, is expanding its foundry operations in Waukesha, Wis., as part of the firm's gradual shutdown of the McCormick Works, Chicago. Harvester is buying several acres of land adjacent to its Waukesha plant to build a 34 x 80-ft pattern storage building and will remodel and modernize existing foundry facilities. Casting capacity will be increased from 15,000 to 30,000 tons a year within two or three years.

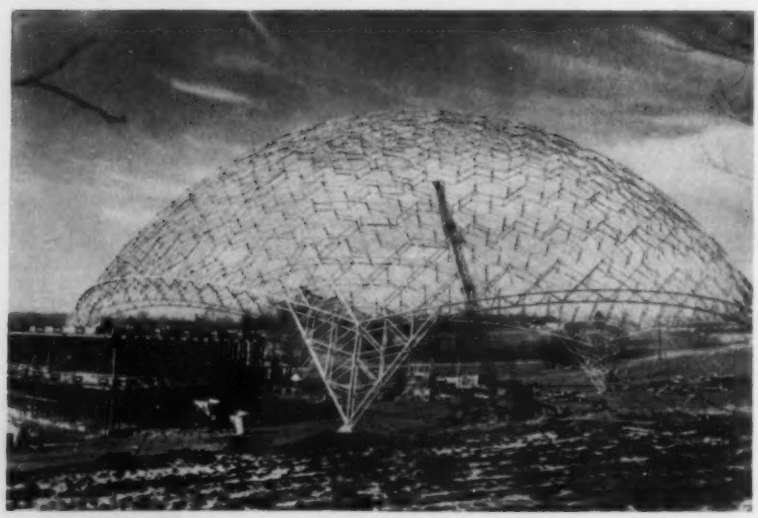
Arthur Tickle Engineering Works, Brooklyn, N. Y., has acquired the bimetallic foundry production of Al-Fin Div., Fairchild Engine & Airplane Corp. Al-Fin will continue its design, consulting, licensing, and supervisory functions, but will transfer its equipment, molds, patterns, and some key personnel to Tickle Engineering. Fairchild's Deer Park, L. I., N. Y., engine plant has been closed.

American Smelting & Refining Co., New York, has joined a group of Mexican partners to form Zinc Industrial S. A., the first Mexican producer of high-grade zinc used principally for diecasting. A new refining plant at Tlalnepantla, near Mexico City, is scheduled for production in late 1959 or early 1960. Asarco owns a 50 per cent interest in the new company.

Manheim Brass Foundry Inc., Manheim, Pa., has been purchased from C. B. Tool Co., Lancaster, Pa., by Robert F. Muhleman. The plant produces aluminum and copper-base alloy sand castings. Mr. Muhleman formerly was associated with Cochrane Foundry Inc., York, Pa., and has served as a director of Conestoga Foundrymen's Association, Lancaster.

United States Gypsum Co., Chicago, will construct a 100,000-sq-ft research laboratory on a 10-acre site in the northwest section of Des Plaines, Ill. The building is scheduled for occupancy in the spring of 1960.

MicroFusion, division of Richier Co., Paris, France, has been licensed by Misco Precision Casting Co., Whitehall, Mich., to use Misco's Mono-Shell process and Double-V (vacuum-melt, vacuum-cast) system.



ASM HEADQUARTERS: Rising rapidly beneath its now completed geodesic "space lattice" dome, the new semicircular headquarters office building of the American Society for Metals is scheduled for completion late this summer. The huge open dome of aluminum, 250 feet in diameter, rises ten stories high

Southern Diecasting Co. has been opened at 13121 South Dixie Highway, Miami 55, Fla., and will specialize in zinc alloy diecastings up to 2 lb. President is Alex L. Homery, formerly chief engineer, Benada Aluminum Products, Girard, Ohio.

American MonoRail Co., Cleveland, has signed licensing agreements with Herbert Morris Ltd., Loughborough, England, through which British MonoRail Ltd., Brighouse, Yorkshire, England, a subsidiary of Morris, will manufacture overhead monorail and monorail crane equipment and automatic cleaning units for the textile industry, and will offer material handling engineering. American MonoRail had an interest in British MonoRail before its purchase by Morris.

American Steel Foundries, Chicago, has purchased the entire assets and business of South Bend Lathe Works, South Bend, Ind., and will operate the firm at its same location as a subsidiary, under the name South Bend Lathe Works Inc. Russel E. Frushour will continue as president of South Bend Lathe.

Kaiser Aluminum & Chemical Corp., Oakland, Calif., will construct a new plant at Midland, Mich., to produce high-purity periclase, a dense, crystalline magnesia, and other magnesia-containing refractory grains. Production is scheduled to begin early in 1960 with initial capacity of 45,000 tons of periclase per year.

Baroid Chemicals Inc., subsidiary of National Lead Co., Houston, has appointed Sinclair-Brandt Equipment & Supply Co., 6620 Dixie Drive, Houston, Tex., to distribute National Western bentonite and Petro Bond in Texas.

Aeroquip Corp., Jackson, Mich., has appointed eight new distributors: Shako Inc., Latham Traffic Circle, P. O. Box 966, Latham, N. Y.; Carter Engine & Equipment Co., 633 Walnut, Box 463, Abilene, Tex.; Southern Equipment Co.,

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P. O. Box 946, El Dorado, Ark.; Industrial Equipment Corp., 330 N. Kansas Ave., Springfield, Mo.; Dick Adams Inc., P. O. Box 960, Aiken, S. C.; Uebler's, Vernon, N. Y.; Sterling Supply Corp., 1-35 Porter St., Philadelphia 48, Pa.; and Derkin & Wise Inc., 356 Morris St., Toledo, Ohio.

M. W. Isaacson Co., 95 Ruskin Rd., Eggertsville 26, N. Y., and 420 Lexington Ave., New York, N. Y., is a new management consulting firm specializing in marketing and new product development in the metalworking industry. It was formed by Melvin W. Isaacson, formerly with the Powdered Metals Products Div., Yale & Towne Mfg. Co. and with Curtiss-Wright.

Milwaukee Tool & Equipment Co., Milwaukee, has appointed Surpless, Dunn & Appleyard Inc., 57 Leonard St., New York, N. Y., to handle local distribution of its malleable iron vises, pipe tools, and screw jacks.

Sparta Mfg. Co., Sparta, Wis., has completed a foundry addition to its facilities which enables it to produce cylinder sleeve castings for air-cooled engines.

Claud S. Gordon Co., Chicago, has appointed Fillo Sales & Engineering Co., 4410 Chateau Ave., St. Louis, Mo., to be exclusive representative in the greater St. Louis area for its line of hand pyrometers, thermocouple assemblies and accessories, drilled wells, and thermocouple wires.

Pangburn Foundry Co. has been established in Pangburn, Ark., with present capacity of 14,000 lb of gray iron, brass, and aluminum castings per day. Owner and operator is Mrs. Thelma Brashears.

Glendale Optical Co., Valley Stream, L. I., N. Y., has established a new warehouse distributor to handle its optical safety equipment in Nevada, Arizona, Oregon, Washington, Idaho, Utah, and California.

Fibre-Metal Pacific Co. will take over the distributorship and will occupy warehouse and office space at 7332 S. Garfield Ave., Bell Gardens, Calif.

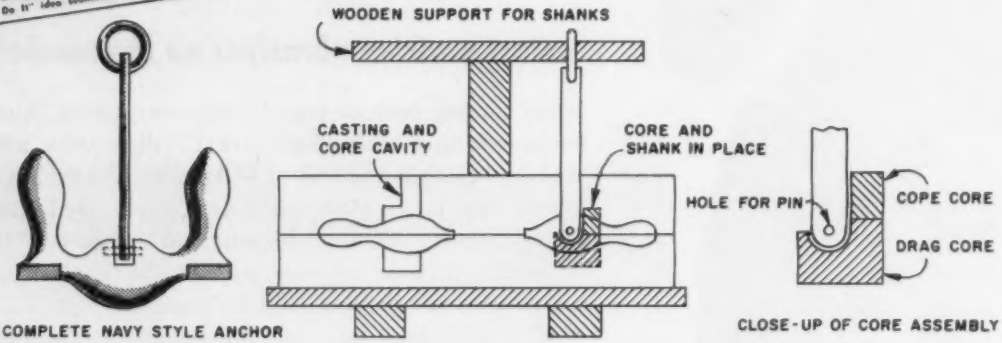
Bunker Hill Co. has appointed National Lead Co., New York, to be sales agent for the distribution of its zinc-base alloys in the United States, excluding the West Coast area.

Hunt Valve Co., Salem, Ohio, is constructing a 12,000-sq-ft office building. Five expansions during eight years have increased the company's manufacturing area from 14,000 to 60,000 sq ft.

Air Reduction Pacific Co., division of Air Reduction Co., New York, has begun construction of a $3 million liquid oxygen, nitrogen, and argon plant in Richmond, Calif. The plant will produce 30 tons of these products daily and is scheduled for completion by the end of this year.

HOW To Do It

FOUNDRY will pay a minimum of $15 for each "How To Do It" idea submitted and published



Casting-in a Movable Shank

By JAMES J. SILK
Foundry Supervisor
Taylor & Co.
Brooklyn, N. Y.

CASTING a movable shank in a part is not too difficult, and it eliminates an expensive forging operation. In the case of the Navy style anchor pictured here, the method returned a profitable item to foundry production. Core prints fixed to split cope and drag patterns provide a slot for 90-degree movement of a ⅜ x 2-in. hot-rolled steel shank. The drag core which fits in this slot holds the semicircular bottom of the shank; the cope core provides perpendicular support for the shank.

Before the mold is closed, the shank is pushed through a slot in the cope and a ⅝ x 2-in. pin inserted in a hole drilled in the shank as shown. Zirconite wash is applied to the area of the shank which protrudes into the mold cavity to prevent adherence to metal poured into the mold.

Circle 620 on Page 53→

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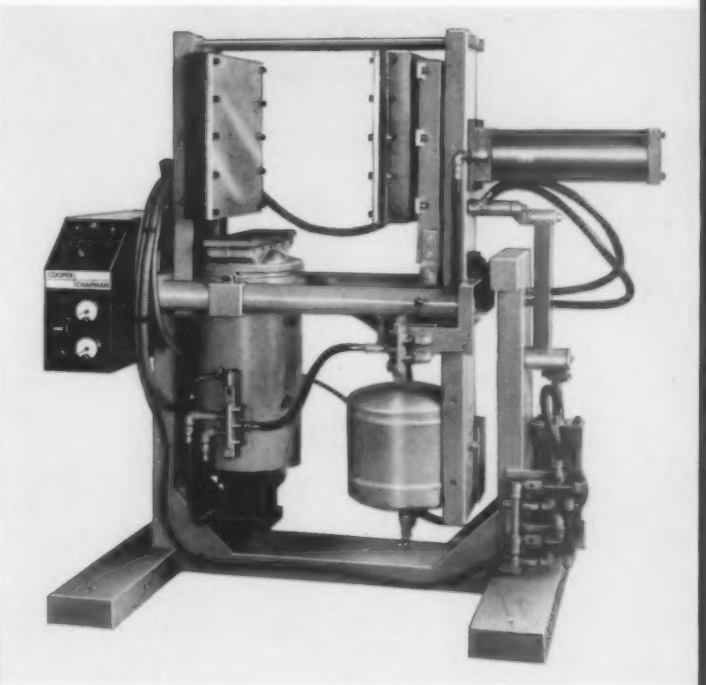
shell core blower

The finest, most economical
Shell Core Blower
available today

Field proven
for 2 full years



MODELS AVAILABLE

C-1615 — 7" maximum diameter core
C-1221 — 7" maximum diameter core
C-2021 — 9" maximum diameter core
C-1626 — 9" maximum diameter core
C-2415 — 9" maximum diameter core

Obtainable with semi-automatic or fully automatic pushbutton controls.

NOTE: *Model number designates maximum height and depth of box*

- High productive capacity
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- Quick core box change
- Adjustable blow pressures
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- 300 to 700° F. thermostatic control
- Curing starts immediately

1 operator

2 machines

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floor model manual machine

- **easily rotated**
- **accurate**
- **fast**

Automatic timing control panel to signal the investing and curing cycles (optional)

Counterbalanced for light or heavy core boxes (same as larger models)

Double production possible with uniform 700°F. thermostatic control

MODEL C-1015 x 6

Clamping cylinder outside main frame results in a compact, rigid, strong unit.

Flat heating elements cover 75% of the heater plate back, resulting in low watt density per square inch. Means more efficiency — longer life.

Specifically designed to operate up to 700° F. for maximum production.

Investigate the many additional, outstanding features now.

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LITHO IN USA D8

Foundry Developments

By EDWIN BREMER
Metallurgical Editor

Withstands the Heat

EXPERIMENTAL aluminum alloy said to have superior tensile strength at 600° F is described in "Metallurgical Investigation of Aluminum Alloy X2219-T6," designated as report PB 151235 and obtainable from the Office of Technical Services, U. S. Department of Commerce, Washington 25, for 75 cents.

The alloy, which contains copper, manganese, vanadium, and zirconium, exhibited properties of 20,000 psi tensile strength, 15,000 psi yield strength, and 25 per cent elongation after 100 hours exposure at 600° F. Stress rupture and fatigue properties were good in the 500 to 600° F range.

Vacuum Deposition

NEW low-cost method for vacuum deposition of cadmium makes it possible to protect high-tensile steels against corrosion without danger of hydrogen embrittlement, according to NRC Equipment Corp., Newton, Mass. The new method is said to compare favorably with electroplating in cost and quality of coating. The cadmium plating process is related in principle to the vacuum metallizing method being used to decorate plastics, die castings, and metal stampings.

Cobalt Applications

ACCORDING to Cobalt Information Center, the second issue of its quarterly, *Cobalt*, now is available to those interested. It contains an article on cobalt-chromium-iron base alloys with interesting oxidation, corrosion, and wear-resistant properties.

A paper on "Cobalt in Steels" discusses improvements in carbon and alloy steels by cobalt additions and one on "Alloys for the Aircraft Industry" reviews alloy developments, requirements for aircraft components, and cobalt-containing alloys. It also contains 129 abstracts on cobalt from current literature. For a copy write on company letterhead to Cobalt Information Center, c/o Battelle Memorial Institute, 505 King Ave., Columbus 1, Ohio.

Surface Plastic Coated

ACCOMPANYING illustration shows the trowelling of a 1/16-in. epoxy resin coating on the interior of a nodular iron casing for a 54-in. vertical, single-stage, single-suction centrifugal pump. The coating provides protection against corrosion and improves efficiency by reducing surface friction. The pump, rated at 120,000 gpm at 80-ft head, is one of three being supplied by Allis-Chalmers Mfg. Co. for the new Hyperion effluent pumping station at Los Angeles. To date the pumps are the largest built of nodular iron by Allis-Chalmers, each casing weighing 17 tons.

Resists High Temperatures

DEVELOPED as a container material for molten fluoride salts, a new nickel-base alloy is being produced on a developmental basis by Haynes Stellite Co., Div., Union Carbide Corp. The new alloy, called Hastelloy alloy N, evolved from work done at Oak Ridge National Laboratories, and contains 6 to 8 per cent Cr, 15 to 18 per cent Mo, 5 per cent maximum Fe, 0.5 per cent maximum Si, 0.8 per cent maximum Mn, 0.04 to 0.08 per cent C, and remainder Ni.

The material is reported to resist embrittlement on continuous exposure to service temperatures up to 1600° F, and tests have shown sufficient oxidation resistance in air for continuous operation at 1800° F. It can be supplied as sand, shell, and investment castings as well as in various wrought forms to meet sundry applications.

Extends Bearing Life

DEVELOPMENT of a chromium-plated cast iron sealing ring which has greatly reduced oil loss on back-up roll bearings in steel strip mill operations is reported by Metal Products Div., Koppers Co. Inc., Baltimore. It is said that these are the first cast iron rings ever used in this application. They replace soft seals and metallic seals made of chromium-plated aluminum bronze.

Performance of the rings is attributed to the application of 0.002 in. of chromium to the wearing surfaces. It is claimed that the rings under normal operating conditions will last from 3 to 5 years and during that period, in addition to reducing oil losses, will decrease oil contamination and extend the life of the bearings.

Columbium in Steel

PRODUCERS of wrought steel have shown considerable interest in the fact that small additions of columbium to carbon steels have produced exceptionally high yield strengths. Some observers doubt that such additions to cast carbon steels would be equally successful, but several foundries reportedly are carrying on investigations to determine the possibilities.

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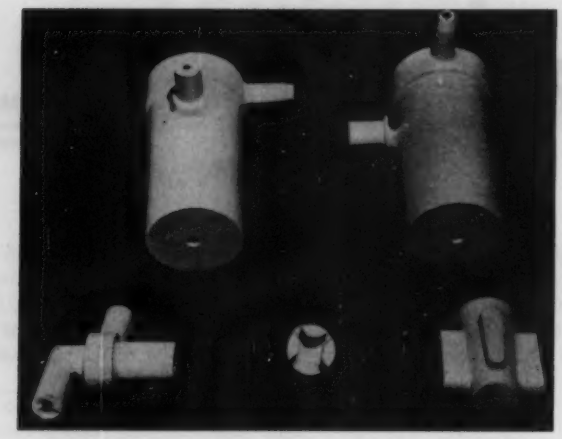

Fig. 1—Examples typify the variety of CO_2-hardened cores made at Pittsburgh Brass Mfg. Co.

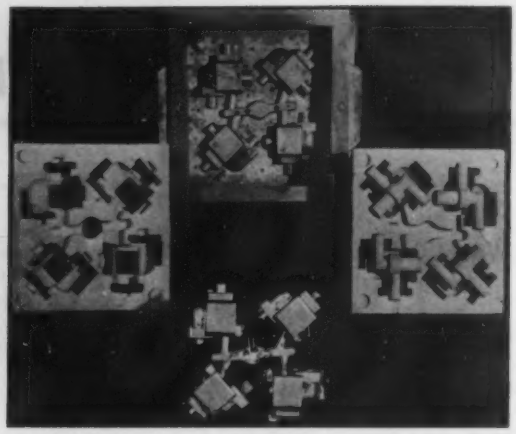

Fig. 2—Pattern, mold halves (with cores in place), and completed aluminum coolant system valve bodies

CO_2 SAND HARDENING

Aids Castings Output, Tolerances

By JAMES W. HAMBLEN
Manager, Technical Applications
Cardox, Division of Chemetron Corp., Chicago

● CO_2 sand hardening is enabling two foundries to produce nonferrous castings on which they can hold tolerances of as little as ±0.005 in., if necessary, on small parts. Use of this process also permitted them to increase production capacity to supplement their conventional nonferrous foundry practice.

As a result, these foundries, Pittsburgh Brass Mfg. Co. and Brass & Bronze Casting Co., both of Pittsburgh and operated by the same management, have entered the field of high-production, close-tolerance nonferrous casting at small capital expense and no sacrifice in production flexibility. Extra operating costs are minimal and are offset to a great extent by the elimination of core driers.

Close Tolerances—Casting tolerances are a function of the dimensions involved, but the two companies have found that on small castings they can hold tolerances of ±0.015 in., and dimensional variation from one casting to the next is not more than 0.001 in. On the basis of tests they have conducted, both companies further believe that they could hold tolerances of ±0.005 in. if called on to do so.

On one small casting, Pittsburgh Brass required a tolerance of only ±0.029 in. to eliminate the need for subsequent milling; in addition, it was able to reduce the cost from $1.07 (before milling) to 37 cents.

A CO_2 semiprecision molding process developed with the aid of Cardox, Div. of Chemetron Corp., Chicago, is responsible for this precision and for accompanying improvements in surface finish and over-all casting quality. Speed and low cost of the system are no less important than improved casting quality.

The only capital outlay required to set up the process at Pittsburgh Brass, where cores and molds are hand rammed, was for a manually operated gassing station. At Brass & Bronze Casting Co., a semiautomatic coreblower and two semiautomatic CO_2 gassing stations were installed. In operation, the CO_2 process has proved to be extremely fast and flexible. Either foundry can, if necessary, get a rush job into production in half an hour.

Fig. 1 through 6 show cores, molds, and castings which illustrate the results that have been attained. Fig. 1 shows cores of complex shape with fragile projections easily made by CO_2 hardening. The castings in Fig. 2 are aluminum coolant system valves to handle freon at 100 psi. Pattern, cope, and drag (with cores in place) are grouped around the castings, in which the detailed, high-finish surface is apparent although they have not been sandblasted.

The finned tube unit mold and pattern in Fig. 3 indicate the depth

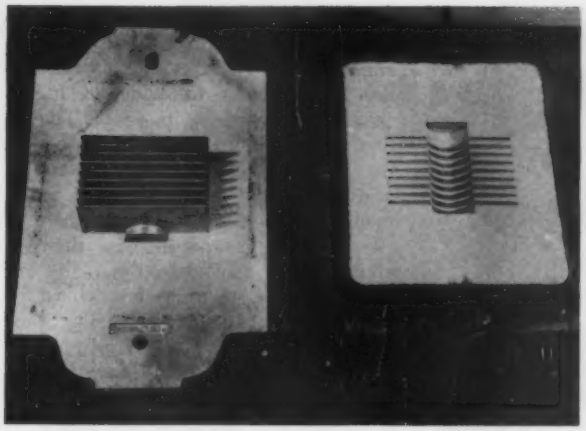

Fig. 3—Pattern and drag mold for finned tube show depth of draw which is possible with CO_2 process

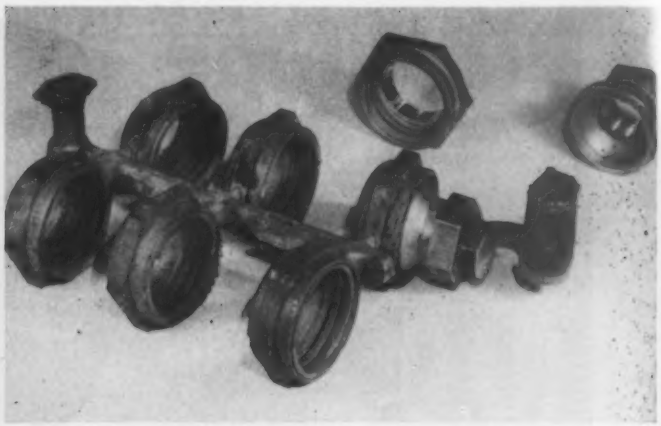

Fig. 4—Blast furnace union nuts need only blast cleaning. At right, a union on sprue is screwed into nut

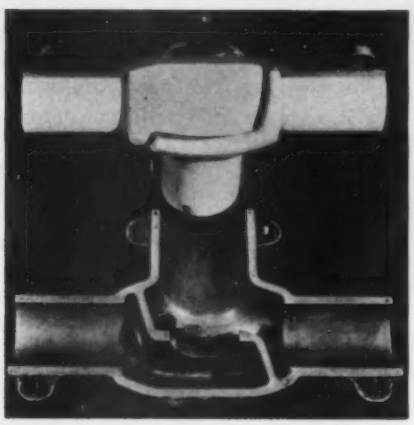

Fig. 5—Corebox and core for high-pressure valve show larger shapes cast successfully with the CO_2 process

Fig. 6—Illustration shows "antique" brass plates and door knobs before and after blasting. Note intricate detail

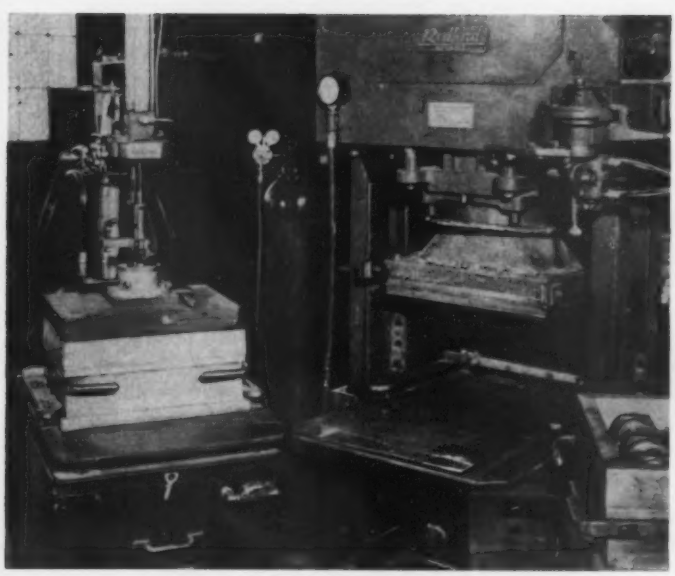

Fig. 7—After it has been blown and squeezed, mold is gassed at one of two automatic gassing stations

Fig. 8—Closing mold after blowing and gassing on semiautomatic equipment at Brass & Bronze Casting Co.

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I'd always used crucible furnaces in my shop, until a few years ago. Then, I switched.

But not for long!
I'm back to
crucible furnaces again.
Why? two counts:
Cost, and **flexibility.**

Know what I found? My crucible cost, per pound of metal melted is **no higher** today than it was in 1940! Sure, crucibles cost a little more today, but I get more heats. I checked my old records, and per pound of metal melted my **crucible costs are the same!** And another thing — **flexibility.** On a lot of these non-crucible furnaces, try and change from one metal to another without contamination! But in my crucible furnaces, I just change from one crucible to another, fast, simple, and trouble free!

From now on, its **crucible melting** for me!

These manufacturers are ready to assist you with melting and pouring problems, foundry layouts and crucible furnace servicing.

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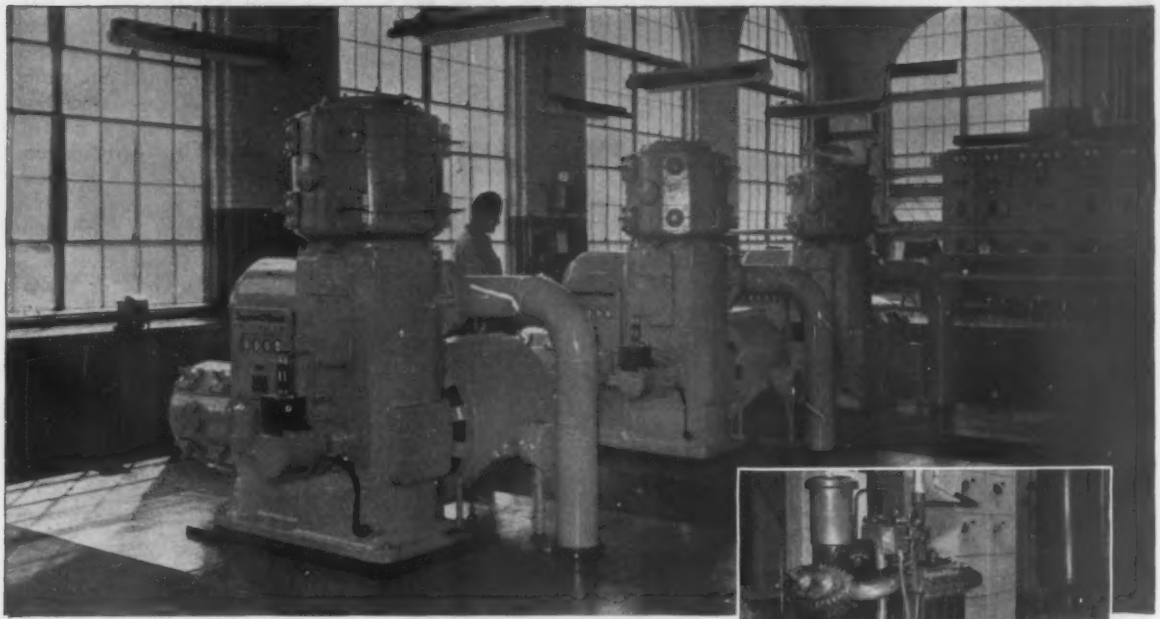
of draw which can be achieved without difficulty in a CO_2 hardened mold. The fins of this unit are 3 in. deep, 6 in. wide, $\frac{1}{8}$ in. thick, and spaced $\frac{3}{8}$ in. apart. The original castings made from this pattern turned out to be too smooth, and subsequent molds had to be made of coarser sand to roughen the fin surfaces and increase their area for more effcient cooling.

The Class 2 threads of the blast furnace union nuts shown in Fig. 4 are used as cast with no finishing other than blasting. A large core for a high-pressure valve is shown in its corebox in Fig. 5, and Fig. 6 indicates the intricacy of detail which can be produced in molds made by this process. The new brass "antique" door knobs are reproduced faithfully, artificial wear and all, by patterns made from the original knobs.

Setting Up — Before Pittsburgh Brass went into production, experiments established a relativelv standard system, subject to modification for specific jobs, for employing the process. The standard core mix consists of AFS 130 subangular silica sand and a commercial sodium silicate binder which contains its own collapsing agent. For castings with which shakeout is known or expected to be a problem, a carbonaceous material—either powdered carbon or pulverized sugar—may be added.

"Cantrell, you have the same devil-may-care attitude toward hot metal as your predecessor— may he rest in peace"

How to squeeze more profits out of your COMPRESSED AIR POWER



Three 125-hp XLE compressors generating air power for a weapons plant. This compact two-stage unit features pipeless Thru-Frame air flow and full-floating aluminum bearings which never need adjustment. Sizes 125 to 350 hp. (Other I-R air compressors to 4000 hp.)

This air-cooled two-stage Type 40 compressor is one of several furnishing plant air and instrument air in a power plant. Sizes 25 to 125 hp. (Others from ½ hp.)

Make sure you have enough pressure at point of use—and extra dependability at point of generation

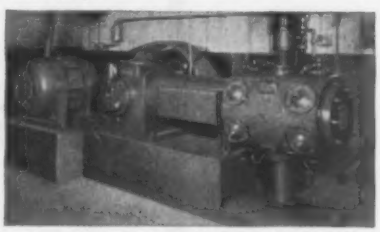
Cost-conscious plant engineers and production men know that to get the full savings inherent with air-powered equipment, you must have full air pressure at every tool.

But it's equally important to guard against unscheduled shutdowns where your air power is generated. This problem can best be solved at the time of purchase, by specifying compressors that have an extra margin of safety against mechanical troubles.

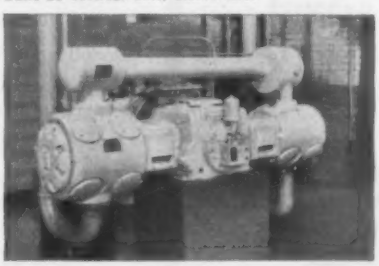
Ingersoll-Rand compressors have that extra safety margin built in. They'll stay on the job longer, with minimum attention and maintenance. Take valves, for example—the most "vulnerable" point in any compressor. Only I-R compressors have Channel Valves, known the world over for efficiency, quiet operation and long life. Their exclusive air-cushioned action eliminates impact and greatly reduces wear.

Also in I-R compressors, all running parts are sealed against dust and dirt which might cause wear. The seal need never be broken, since bearings are a type which will never need adjustment.

For top compressor performance and long-run economy, specify Ingersoll-Rand. And ask your I-R representative to show you how to get your maximum *"Dividend on Payroll Dollars"* with a Planned Annual Review of your air power system.



Ingersoll-Rand's new ESH horizontal compressor, here in a tool factory. Sizes 20 to 150 hp. Also built as vertical unit, called ESV.



Two-stage balanced-opposed PHE compressor handling air in a gas plant. Also built as L-design unit with packaged intercooler. Sizes 75 and 100 hp.

Ingersoll-Rand

1-915

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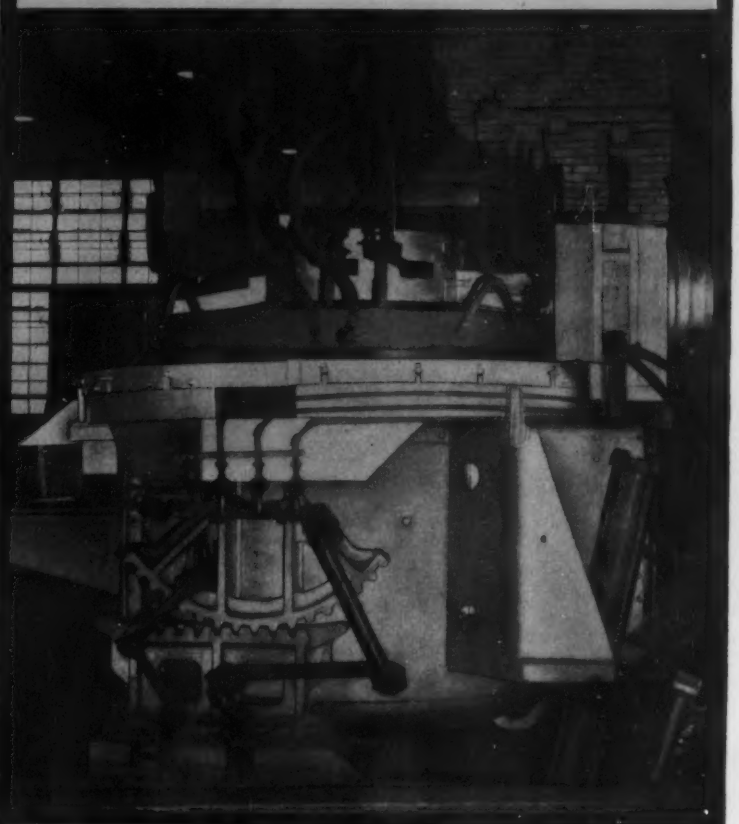
CONTROL ELECTRIC FURNACE FUMES



Pangborn offers a new concept in electric furnace exhaust hoods!

After years of development, Pangborn now offers effective control of smoke, fumes and dust from electric melting furnaces with minimum interference to furnace operations and maintenance. The hood design is based on the fundamental dust control principle of confining and capturing fumes and dust immediately adjacent the source. Effective control is secured with substantially reduced exhaust air volumes.

The Pangborn Exhaust Hood reduces the weight carried by the furnace roof; reduces hood areas subject to high temperatures; reduces electrode travel limitations and is applicable to top and side charge furnaces of all types and sizes.

With the exhaust hood connected to an efficient Pangborn Cloth Bag Collector, compliance with the most rigid air pollution control regulations is assured. For information call the Pangborn man in your area or write: PANGBORN CORP., 1400 Pangborn Blvd., Hagerstown, Md. *Manufacturers of Blast Cleaning and Dust Control Equipment.*

Pangborn CONTROLS DUST

In addition, kerosine also is included in the mix as a lubricant for sand used in the coreblower at Brass & Bronze Casting Co.

Core sand is purchased in 100-lb, double-walled bags and stored indoors to keep it free of moisture. The binder added to the mix varies from 3½ to 5 per cent depending on the dimensional stability needed. When required, the carbonaceous collapsing agent is added in quantities of 2½ to 3 per cent. Mixes to be blown contain 0.2 per cent kerosine.

With deep-draw cores or molds, CO_2 process partings are employed if dimensional tolerances are close. If dimensions are not so important, deep-draw cores and molds may be given green strength by the addition of 3 per cent fireclay and ½ per cent water to the mix. These cores and molds then can be gassed after removal from the corebox or pattern.

Sand, binder, and other ingredients are mixed in a 200-lb capacity muller. Mixing times vary from 3 to 4 minutes depending on the job. A typical batch consists of 200 lb AFS 130 silica sand and 9 lb commercial sodium silicate binder plus additional carbonaceous collapsing agent and lubricant as required. Tests indicate that as much as 85 per cent of the used sand can be reclaimed, but neither foundry has attempted reclamation as yet.

Coremaking and Molding — At Pittsburgh Brass, cores and molds are hand rammed in coreboxes and flasks which have been vented for gassing. CO_2 is applied for 10 to 12 seconds at 15 to 20 psi through a rubber cup on the end of a hose from the gas cylinder, although a probe is used occasionally. When a rush job is produced and the cores must be used immediately, they may be overgassed for several seconds to increase their initial strength. If they are to be stored for any appreciable length of time, they are undergassed and allowed to gain strength during storage, which can be for as long as several months.

The semiautomatic production line at Brass & Bronze Casting Co. is shown in the accompanying illustrations. The core and mold blower has a blow capacity of 20

lb and operates on a constant time cycle, blowing cores and blowing and squeezing molds.

After blowing, the corebox or flask is removed from the blower, moved to one of two automatic gassing stations, and gassed for a preset period of time. Because blown cores or molds require less gas to develop full strength, gassing time usually is about 25 per cent less than they require when rammed, and the pressure also is less. Since CO_2 hardening is in any event only a matter of seconds, the fact that two gassing stations are required to handle the output of the blower indicates the speed of the process.

After gassing, a hardened mold automatically is ejected from its flask by stripper pins, and the flask and pattern are ready to return to the blower.

Book Review

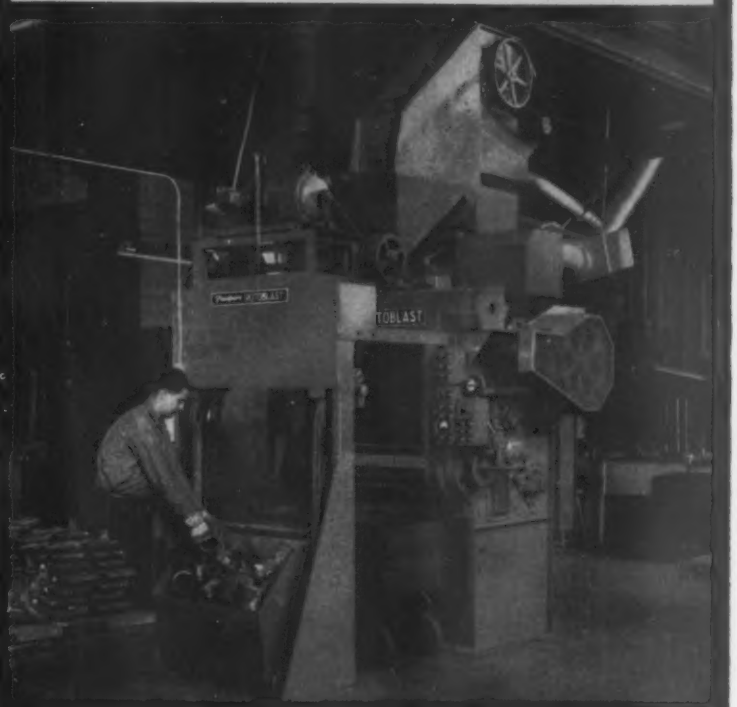
The Flow of Steel in Molds, **edited by C. W. Briggs, cloth, 120 pages, 5½ x 8½ in., published by the Steel Founders' Society of America, Terminal Tower, Cleveland 13. Price $3.50.**

During the last several years considerable research has been devoted to fundamentals of gating. Recognizing the need for a concise discussion of available information, the Steel Founders' Society of America arranged for presentation at its 1958 Technical and Operating Conference a series of six lectures covering the various phases which now are made available in this book.

The lectures, prepared and presented by well known authorities on the flow of metals in gates and molds, are arranged to follow each other in orderly succession to develop the subject systematically.

First lecture on "Fundamental Principles of Flow of Liquids" is by John F. Wallace. The second by R. W. Ruddle deals with "Fluid Dynamics of Flow of Steel." The third, on "Fluidity of Steel and Its Importance in the Flow of Steel," is by H. F. Taylor. Fourth lecture by W. H. Johnson relates to the "Flow of Steel in Runners and In-gates," and the fifth, on "Flow of Steel in Sprues," is by H. F. Bishop. Concluding lecture by C. W. Briggs discusses the "Influence of Gating on Steel Casting Quality."

ROTOBLAST CUTS CLEANING TIME 70%!



Pangborn Rotoblast reduces cleaning time from 15 minutes per load to 4½ minutes at Buckeye Iron & Brass

To reduce costs and still keep up production schedules, Buckeye Iron & Brass Works, Dayton, Ohio, replaced its centrifugal blast cleaning barrel (which is still in good operating condition) with an automated 6′ Pangborn Rotoblast Barrel. The result: cleaning time was cut from 15 minutes per load to 4½ minutes!

Through automation, the Rotoblast Barrel has also saved the company the cost of one full-time operator and has proved economical in terms of maintenance. In seven months, no repairs or replacements, other than vanes, have been necessary!

For full details on how Pangborn Rotoblast can save you money, write for Bulletin 1400 to PANGBORN CORPORATION, 1400 Pangborn Blvd., Hagerstown, Md. *Manufacturers of Blast Cleaning and Dust Control Equipment—Rotoblast Steel Shot and Grit.*

Pangborn CLEANS IT FAST WITH **ROTOBLAST**®

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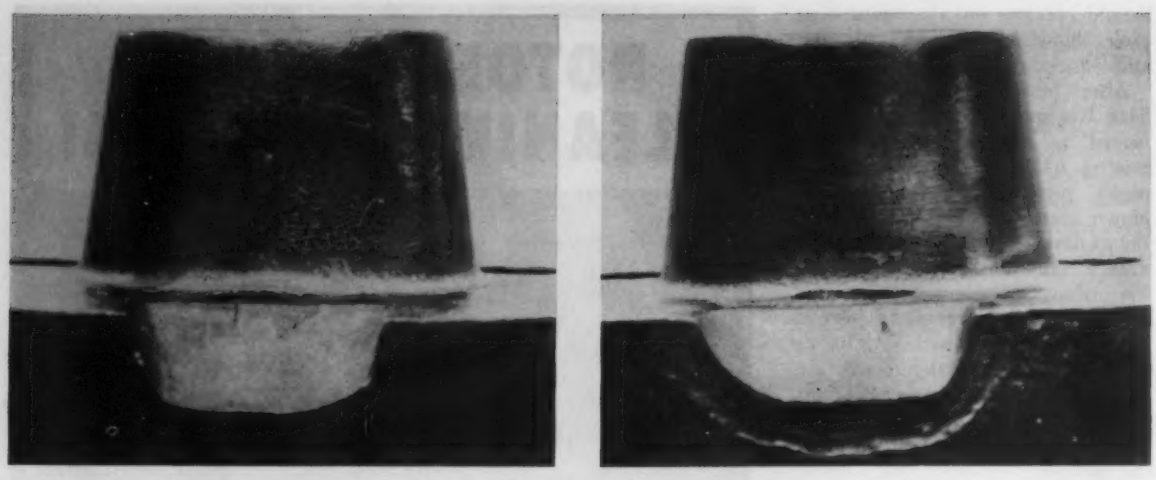


Core of injector inserts used to make 5000 brass castings. Left to right, cores made of standard die steel and of unalloyed molybdenum

Molybdenum-Base Alloy Is Superior Diecasting

DIE CORE MATERIAL

● DEVELOPMENT of a molybdenum-base alloy for use as a diecasting die core material is reported by the Die Casting Research Foundation, an affiliate of the American Die Casting Institute. The new material has shown superior resistance to heat checking or crazing, the most common cause of die failures. This problem is most pronounced with the higher temperature diecasting metals such as aluminum and magnesium-base alloys and brass.

The development resulted from a research program sponsored by DCRF at Battelle Memorial Institute with the co-operation of Climax Molybdenum Corp. of Michigan, Universal-Cyclops Steel Co., and several foundation member companies, whose testing and production facilities were used. The report was prepared by Technical Committee Task Group II, DCRF, composed of J. H. Moorman, Aluminum Co. of America, chairman; C. Grebe, Milwaukee Die Casting Co.; E. Reinhold, Dollin Corp.; F. A. Romano, Monarch Aluminum Mfg. Co.; and C. Zach, Racine Die Casting Co.

In 1953, the foundation commissioned Battelle to conduct an investigation to improve service life of diecasting dies. Properties of hundreds of possible materials were screened, and more than 100 materials were selected for actual laboratory testing to produce heat checking synthetically. Those tested include hot worked and stainless steels, chromium, nickel and cobalt-base materials, cermets, carbides, and molybdenum. Of these materials, only molybdenum displayed substantially superior resistance to heat checking.

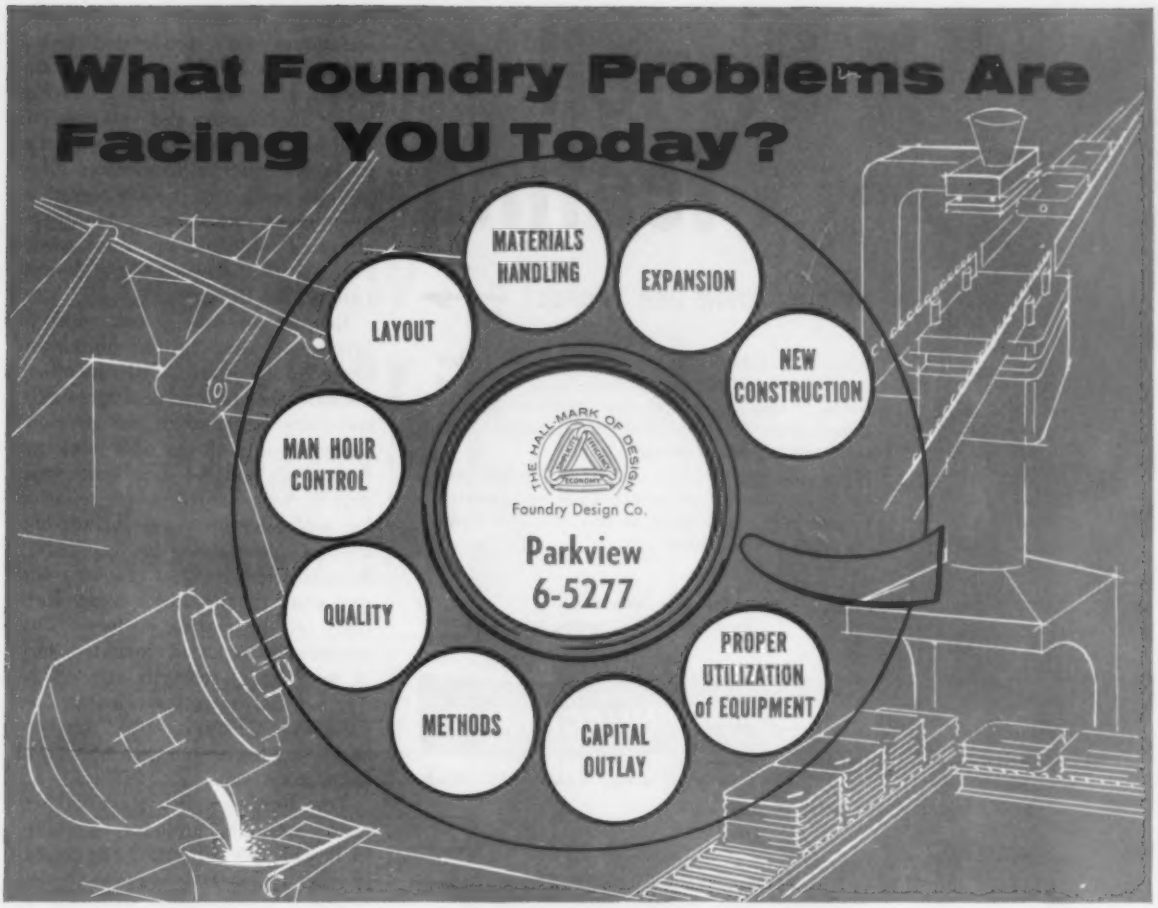
Molybdenum, with one-half the thermal expansion and four times the thermal conductivity of standard die steel would be expected to excel in resistance to heat checking. Furthermore, its hardness, although very low at room temperature, is at least twice that of standard steel at 1500° F and can be increased by improved working and alloying.

Production tests by DCRF members on small and medium-sized cores and inserts substantiated this prediction. The tests indicated a substantial increase in resistance to heat checking compared to standard steel cores, as shown in the accompanying illustration. The accompanying table compares properties of some of the materials which were laboratory tested.

At first, the available molybdenum alloys were extremely brittle in the transverse direction. This tendency resulted in gross cracking in the direction of working. Elongation sometimes varied from 2 to 20 per cent in the same piece. Low room-temperature mechanical properties, limited availability of sizes, and cost also were early deterrents. Higher purity materials furnished by Climax Molybdenum and substantial improvements in working techniques by Universal-Cyclops, a principal fabricator of molybdenum, resulted in greatly improved properties and a reduction of transverse

Properties of Some Alloys Evaluated for Resistance to Heat Checking

	Thermal Expansion 10^{-6} in./in./° F	Thermal Conductivity Btu/ft²/in./° F/hr	Hardness, DPH Room Temp	Hardness, DPH 1500° F	Resistance to Heat Checking
Standard die steel	7.3	About 180	450	30	Fair
Low expansion, ferrous-base material	13.6	Less than 90	285	42	Exceedingly poor
Molybdenum alloy (with titanium, cold worked)	3.2	About 745	259	131	Very good



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LAKEY FOUNDRY CORP.	Muskegon, Mich.
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MACK TRUCKS, INC. (Steel Foundry),	New Brunswick, N. J.
OTIS ELEVATOR CO.	Yonkers, N. Y.
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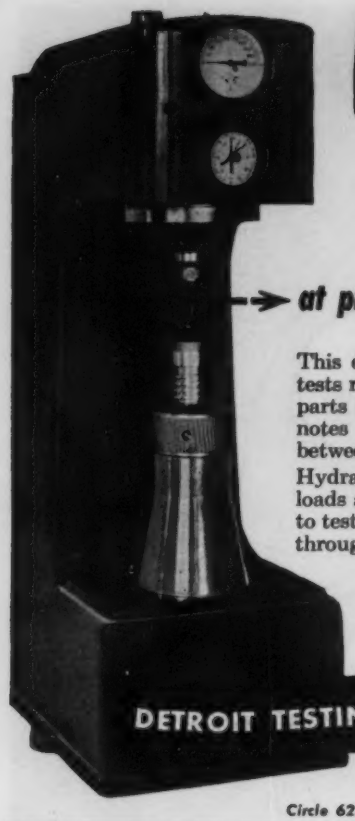

Brinell Testing

→ at production line speeds! →

This direct reading Brinell hardness tester tests round or flat parts *fast*. No grinding of parts is necessary and the operator simply notes that the dial indicator needle falls between pre-set tolerance hands.

Hydraulically applied standard Brinell test loads are used. Foot control allows operator to test parts as quickly as he can move them through the machine.

Write for more information on all our Brinell testing machines.

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Any Design or Dimension
'Light-Weight' Heat-Treat Units for Every Use
PSC fabricated tubes furnish four substantial advantages: (1) Light-wall construction saves furnace time and fuel. (2) Return bends are of same wall thickness as tubes, promoting uniform flow of gas. (3) Smooth dense walls minimize carbon build-up and burn-out. (4) Up to 100% longer life. In any alloy, size or type, including parabolics. Also sheet-alloy heat-treating retorts and covers, boxes, baskets, fixtures, tubes, etc.
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Circle 627 on Page 53

cracking. Materials made by these techniques were production tested by several DCRF member companies as cores in dies producing zinc, aluminum, and magnesium castings and have proved superior to both earlier molybdenum alloy samples and to steel with regard to heat check resistance. Hardness, although improved by added working, is still lower than desired (under 300 Bhn).

Reports on the 70 test cores in production dies casting aluminum observed by the DCRF members indicate that 68 per cent were substantially better than the previous material, only 18 per cent were unfavorable, and 14 per cent were still in test. Advantages reported for molybdenum cores include decreased downtime for polishing, longer life before heat checking and replacement, and lower scrap from tears on the casting surface. Disadvantages reported included lack of mechanical strength and ductility, low hardness, low abrasion resistance, sensitivity to thermal shock at lower temperatures, and high price.

Low hardness, low room-temperature strength, and unavailability in larger sizes hitherto have retarded the use of molybdenum for die blocks. Furthermore, attempts to use molybdenum as a die or core material for brass diecasting have been less encouraging because of premature pitting and gross cracking. As indicated above, however, the DCRF members have reported a long list of successful applications of molybdenum for cores and small die impression components. Familiarity with its use has brought out design and other features to be avoided and enabled more accurate selection of suitable applications to reap the greatest possible benefit from molybdenum.

Hoist Group Issues Directory

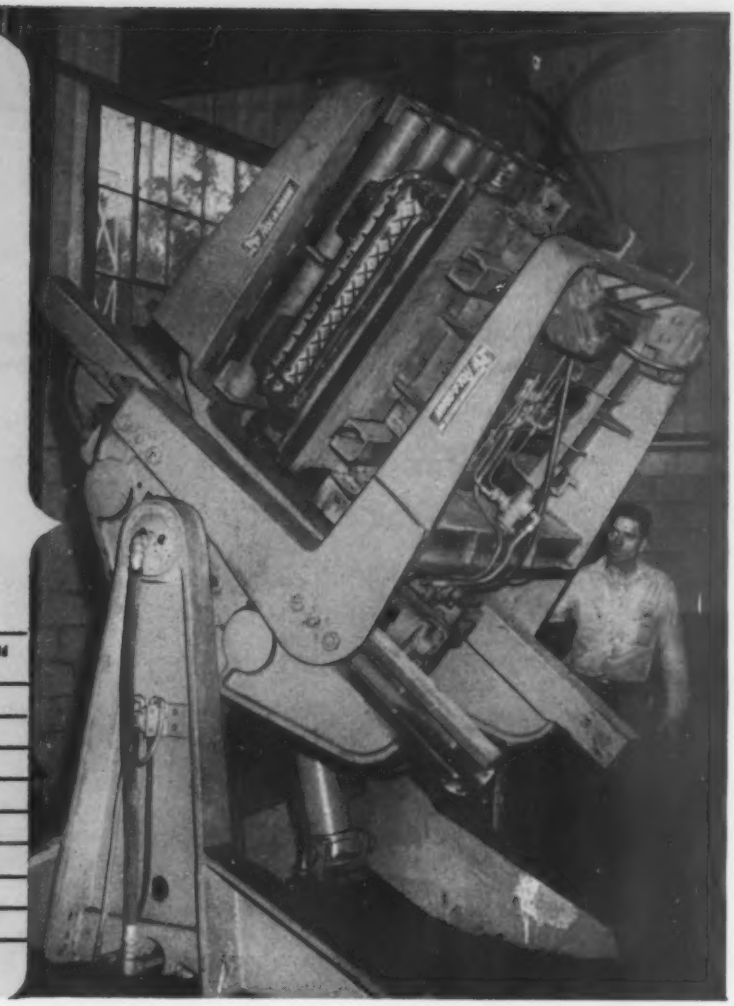
The Hoist Manufacturers Association has issued its 1959 directory. A short history of the association and its objectives are presented. Officers, directors, committees, and member companies, their addresses, and participating personnel are listed. Association headquarters are at One Thomas Circle, Washington 5.

NOW! A NEW ROL-A-DRAW FOR EVERY CAPACITY

1000 to 15000 LBS.

Hydraulic* Rol-A-Draw	Capacity	Draw	Max. Ht. of Mold or Core Box
1015 H	1000 #	15"	32"
1020 H	1000 #	20"	42"
2522 H	2500 #	22"	50"
4025 H	4000 #	25"	58"
6030 H	6000 #	30"	69"
9030 H	9000 #	30"	69"
12032 H	12000 #	32"	73"
15032 H	15000 #	32"	73"

*Full hydraulic operation—pattern clamp—clamping—rollover—draw —(air pattern clamp on 1015H and 1020H—optional on 2522H)



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- ✓ *Lower initial cost*—costs far less than other units of equal capacity
- ✓ *No pits* of any kind required for installation—this alone saves thousands of dollars
- ✓ Rugged steel castings—*heaviest construction* throughout—less maintenance—lower operating cost
- ✓ Unapproachable flexibility—outstanding range—handles present and *future* requirements

CHECK THESE FEATURES THAT MAKE YOU MONEY

- ✓ Automatic sequence control—a single valve actuates entire cycle—errors eliminated, production speeded
- ✓ Extra large capacity—handles bigger molds and deeper draws—eliminate costly crane delays.
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Man to Man

By RALPH L. LEE, *President*

Lee Hobby Foundry
Birmingham, Mich.

"I'm beginning to believe that the farther a foundryman gets away from home, the more likely he will be suspected of being an expert"

The Foundry Expert away from Home

● I GUESS there must be quite a bit of truth to the old saying, "Familiarity breeds contempt," for I'm beginning to believe that the farther a foundryman gets away from home, the more likely he will be suspected of being an expert.

I have always been stubborn in my insistence on retaining my amateur standing as a foundryman. In spite of that, just let me wander far afield from the Lee Hobby Foundry heap, and I'm sure to be embarrassed by some seasoned craftsman's asking me the $64,000 question. In fact, I feel downright hypocritical just listening to such questions, much less trying to answer them.

Not long ago, a fellow with cold feet and a small conventional cupola he had bought but never had used called me up to ask me what I thought. He said that his gang had been toying with the idea of setting it up, but that some experts away from home had discouraged them, even though they needed the additional capacity desperately.

I said, "Now, after all, I'm just an amateur, and when it come to cupolas, I've only had experience with a little old, 10-in., homemade affair. So . . ."

"Yes, I know," he interrupted, "but it struck me that if you can get iron out of that little thing, you should be able to advise us whether our 18-incher would be practical for production."

"Well, look," I butted in, "why don't you gather up the dope you surely must have on your furnace, together with the other data you and your people probably have, since you are already running your big job, and come on out. In the meantime, I'll dig back into my records, my library, and my memory. Then we can chew the fat, although I'll not promise you a thing."

When he came, I showed him our little job with its air pressure and air flow gages and the blackboard on the wall beside it, which still had the warming up and charging schedule for the last heat. I showed him the records we had kept, explained the troubles we have had, the facts of life we have learned, and the precautions we take, none of which were new to him or profound in any respect.

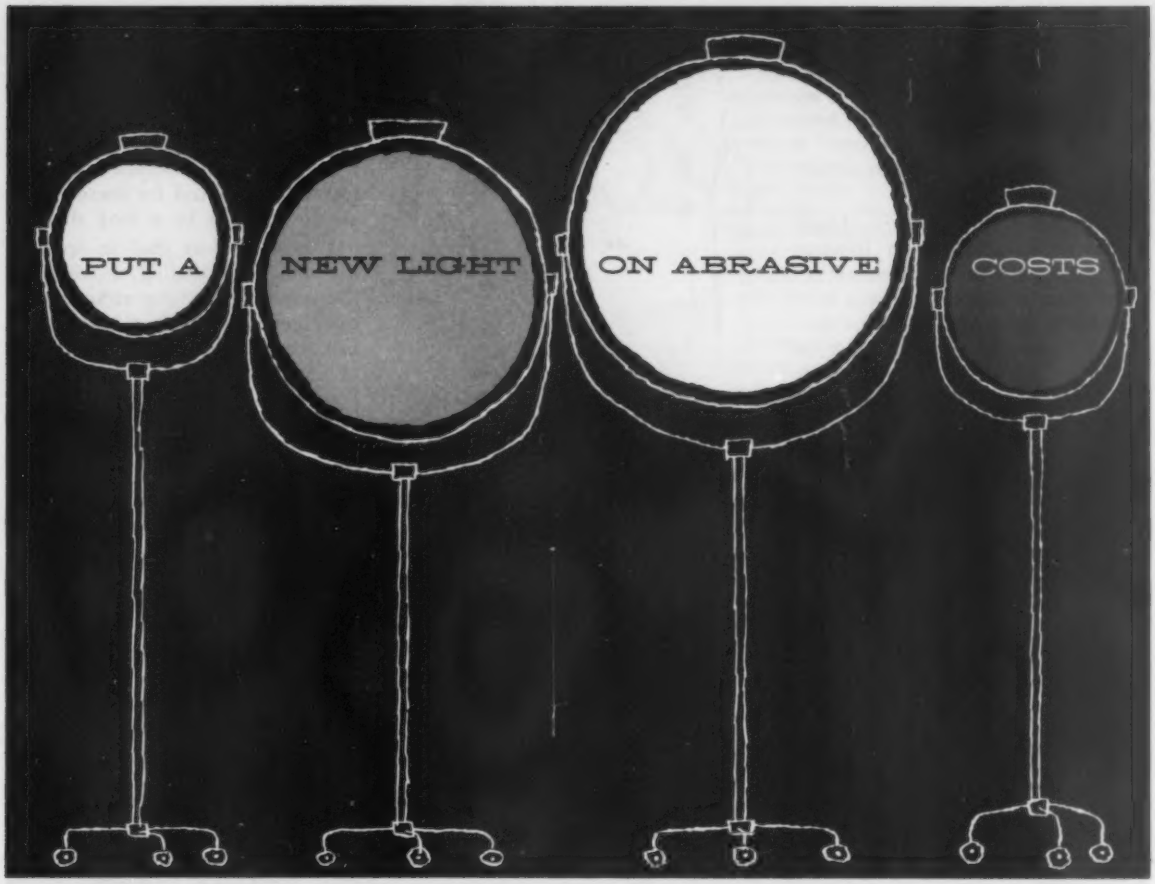
In the shower room, an expert looks just about the same as anyone else

Then we jointly reviewed his instruction manual and the other dope he'd brought, whereupon he took the initiative and wrote down in black and white a proposed step-by-step firing and charging schedule, with the time and everything he could think of for the initial heat. He then decided with no persuasion on my part (that is, none to speak of) to grab the bull by the horns, so to speak, and to give the darned thing a whirl.

I've learned since that the cupola is in regular operation, turning out good iron and more than paying for its salt productionwise. Looking back on this experience, I imagine that my friend knew everyone around his place so well that familiarity sort of shooed him away from too much faith in the counsel of his own gang and sicked him onto strangers—those experts away from home.

I imagine that most of us hear every once in a while of foundry bosses who get fed up to the gills with the messes their outfits have got into and in desperation call in one of these experts to demess the operation in one fell swoop. I don't doubt that some businesses are lying on their death beds, giving their last gasps and that the situation calls for drastic resuseitation, blood transfusions, sulfas, amputations, or shock therapy.

But it seems to me that in a real-



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High quality, efficient shot and grit, applied with good equipment, have a dollars and cents factor that any good ring-wise salesman and cost accountant can appreciate.

Take Cleveland NORMALIZED malleable shot and grit, for instance. It withstands terrific impact without shattering. It has at least twice the life of regular chilled shot and grit. You get 30% to 50% reduction in maintenance costs. Abrasive consumption is materially reduced.

You can put a new light on *your* abrasive costs, by using the Cleveland cost system. It's free and it works. Write us today for more information, together with our new catalog No. 159, or call our nearest representative.

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Circle 629 on Page 53

istic, down-to-earth business such as ours, even the thought or hope that there might be some secret formula or trick of magic which will accomplish overnight what we have been struggling to do for years is not only unrealistic, but also slightly infantile.

Of this I feel quite sure: Crash programs based on such illusions can play hob with an organization. They can knock the props from under the employees' faith in their own ability and their estimate of their boss's faith in them and raise one whale of a question as to the management and leadership ability of individuals who instituted the crash program.

It might well be that the familiarity-breeds-contempt principle covers up resources available in most organizations.

Many organizations and departments I have known have lifted themselves by their own bootstraps after being sold on better ways of thinking and doing. But it took time, and an appreciation of the time it would take played a star roll in the splendid accomplishment.

"Get your own metal!"

There are real experts anywhere, whether at home or abroad, and by golly they're welcome here at the Lee Hobby Foundry. In fact, we've been sponging off them for years.

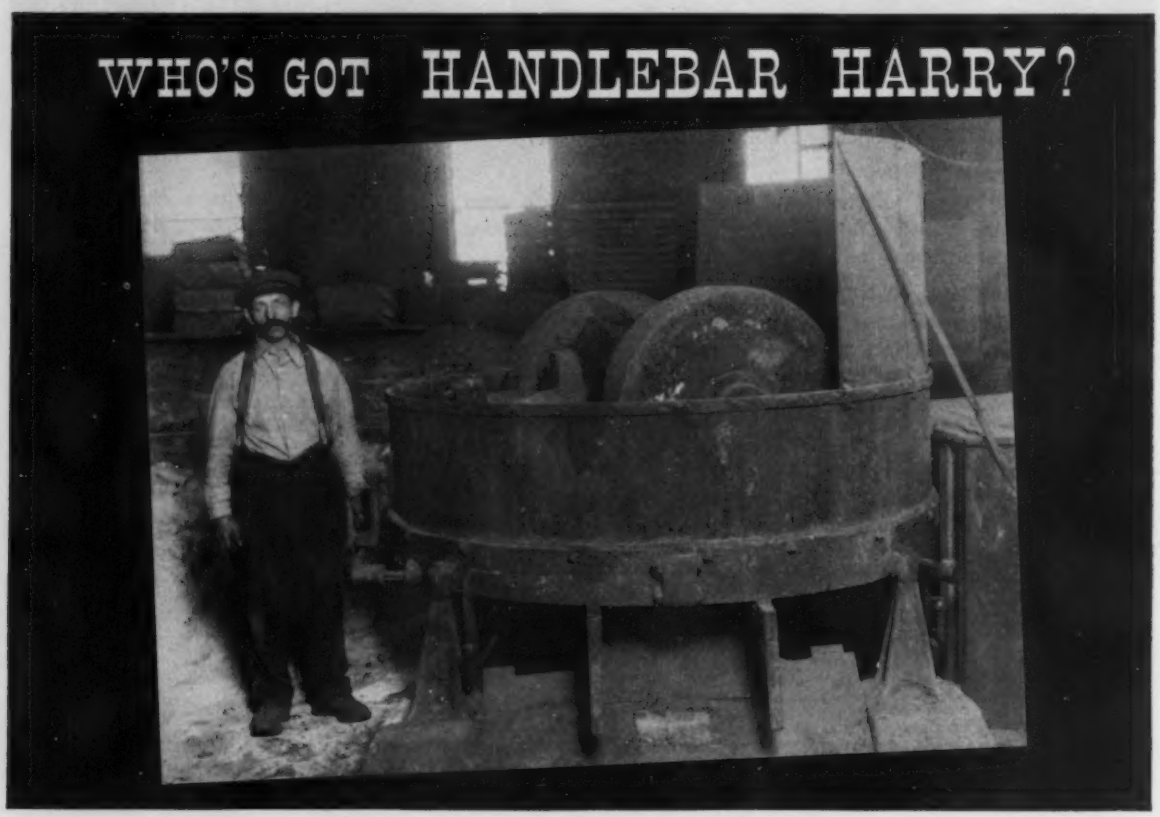
But the thing we always should be careful of is not to take for granted the home experts we rub shoulders with every day. We should keep in mind that the expert away from home sleeps in a bed too, shaves every morning like us, and looks pretty much like the nonexperts when he has his clothes off in the locker room. And he doesn't have all the answers by a long shot.

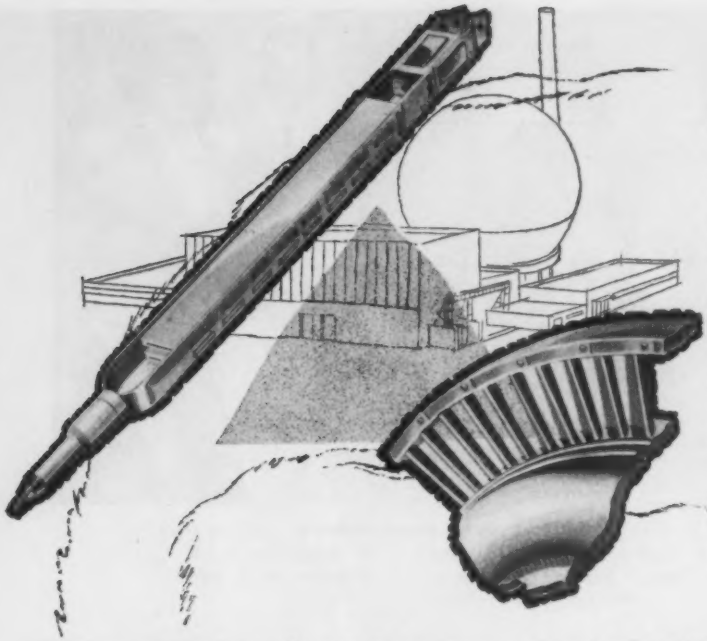
I must confess that in spite of my amateur standing, I really do like experting among strangers. I can't get by with it at home; Mrs. Lee sees to that. (She's chairman of the board of the Lee Hobby Foundry.)

Describes Aluminum Welding

Air Reduction Co. Inc., New York 17, has published a 116-page booklet entitled "Aircomatic and Heliwelding of Aluminum" which presents information on procedures for the inert-gas welding of aluminum with tungsten and metallic electrodes. Booklet is divided into 12 chapters discussing alloys, definitions, welding processes, equipment, supplies, and safety.

Advertisement





Today's metallurgical engineers and scientists are constantly meeting the challenge of sweeping technological advances. Electronic brains that solve "impossible" problems . . . jets and space craft which open brand-new horizons . . . reactors that produce fantastic amounts of nuclear energy. Advances such as these *demand* better metals . . . metals free of inclusions, with better electrical conductivity, increased hot strength, extended creep resistance and fatigue limits. In turn, better refractories are a "must" in order to precisely control purity and composition during the development of these metals.

Metal processors have long relied on the wide range of Norton Refractory products to precisely meet their re-

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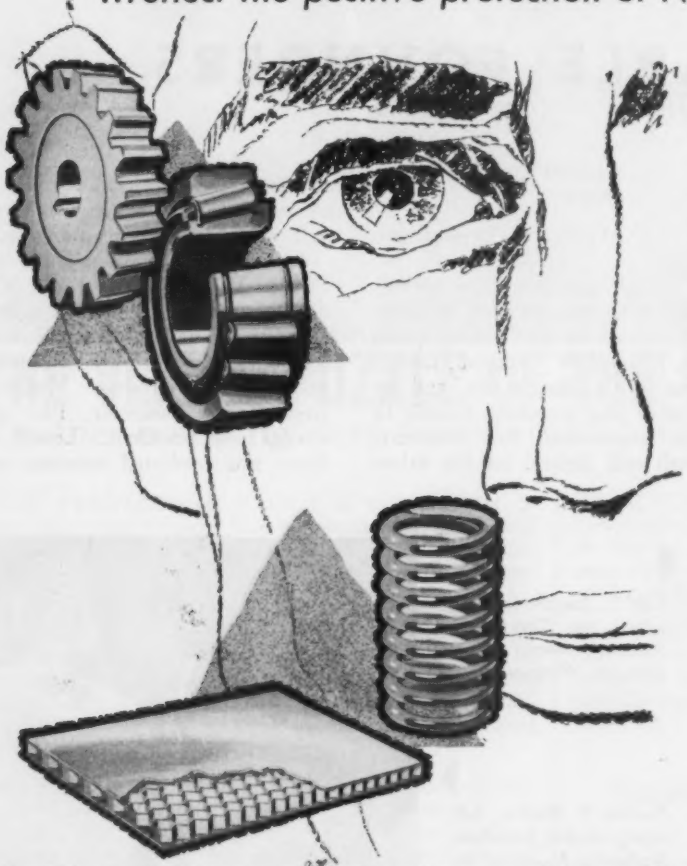

quirements. High purity (99.5%) ALUNDUM* aluminum oxide, outstandingly stable to both oxidizing and reducing atmospheres . . . dense, fused, stabilized Zirconia for operations requiring an inert refractory for extremely high temperatures . . . nonwetting, nitride-bonded CRYSTOLON* silicon carbide...low boron MAGNORITE* magnesium oxide, ideal for vacuum melting. In addition, the Norton Man is constantly helping in process and product development. Backed by Norton Company's extensive engineering facilities, he can offer time and money-saving advice on all refractory problems.

Meet *your* processing requirements more efficiently and economically with Norton Products and Engineering. For complete details write NORTON COMPANY, Refractories Division, 308 New Bond Street, Worcester 6, Mass.

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MFS officers, directors, and staff at the society's recent annual meeting. Left to right, standing: A. F. Crone, D. B. Sanberg, Joseph Abusamra, R. S. Bradshaw Jr., R. C. Hobson, R. E. Whinrey, E. E. Braun. Seated: H. J. Heine, R. V. Osborne, A. E. Salatka, T. T. Lloyd, R. W. Crannell, D. V. Walker, and L. D. Ryan

Research and Marketing Pushed by . . .

MALLEABLE FOUNDERS

By WILLIAM G. GUDE
Managing Editor

● CONTINUED emphasis will be placed by the Malleable Founders' Society on its research and marketing activities. This was indicated at the society's annual meeting held May 25-26 at the Homestead, Hot Springs, Va.

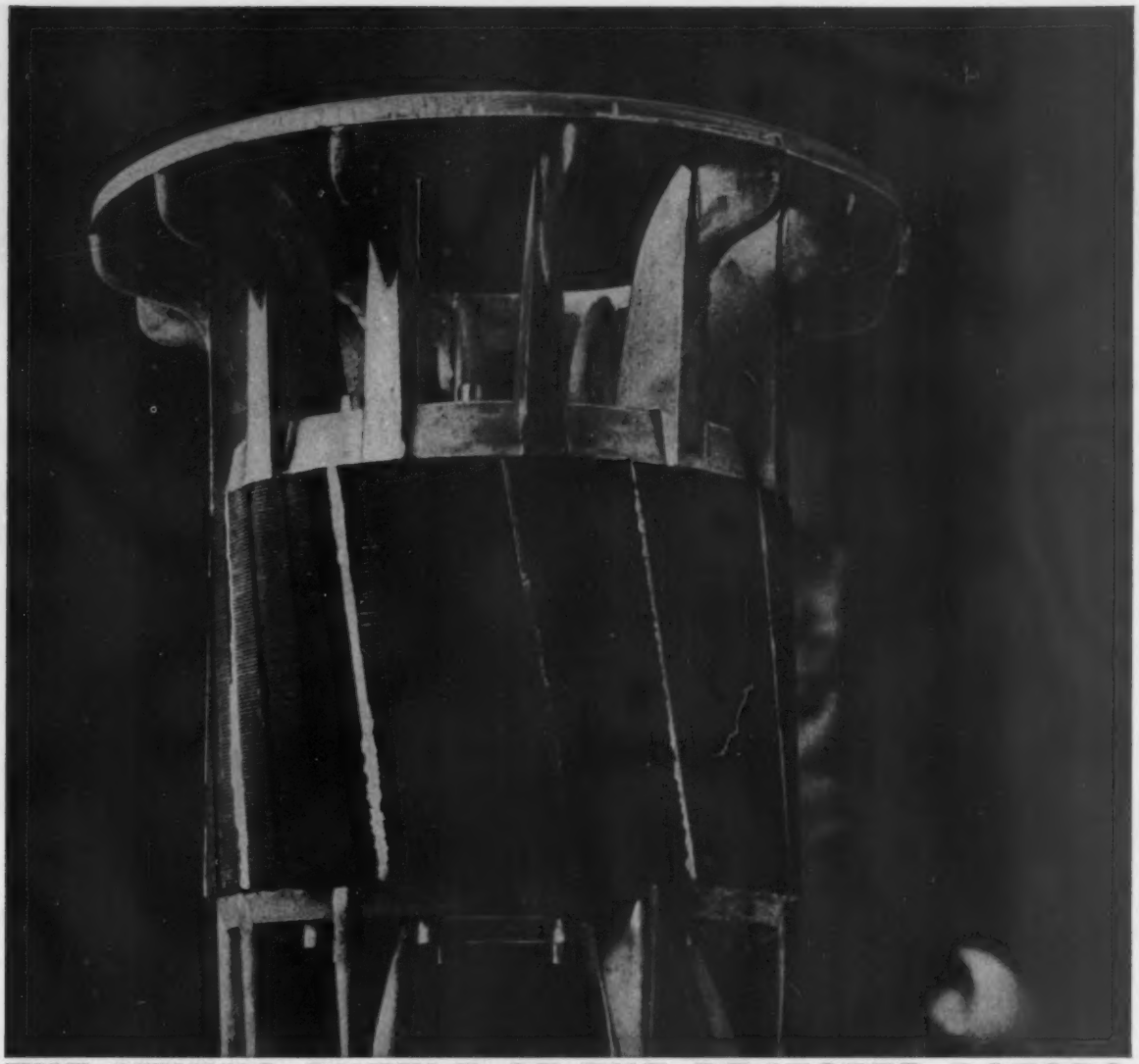
Considerable progress was reported for the past year in both the technical and marketing fields under the direction of the society's Research and Technical Council and its Market Development Council.

Although the immediate outlook in the malleable industry is favorable, reports of the retiring president, Richard W. Crannell, Lehigh Foundries Co., Easton, Pa., and the executive vice president, Lowell D. Ryan emphasized that long-term growth will depend on the extent to which the industry improves its plants and processes and how effectively it markets its products.

In the annual election of officers, Dudley V. Walker, Eberhard Mfg. Co. Div of Eastern Malleable Iron Co., Cleveland, was named president to succeed Mr. Crannell. Charles P. Speitel, Pennsylvania Malleable Iron Corp., Lancaster, Pa., was elected vice president. Lowell D. Ryan was re-elected secretary and

Carl F. Joseph, left, receives the Charles H. McCrea Medal from John A. Wagner

Dudley V. Walker, left, newly elected president, Malleable Founders' Society, and George T. Boli, past president



THE VEXING PUZZLE OF THE REJECTED ROTORS

Another costly mystery solved–by the man from Kaiser Aluminum

THE PERPLEXING FACTS. A manufacturer of electric motors brought Kaiser Aluminum a perplexing problem. He was having difficulty casting sound rotors. His main problem was porosity which resulted in many rejected units.

HOW THE CASE WAS SOLVED. When the man from Kaiser Aluminum reviewed the casting process, he recommended a correction in fluxing techniques—and suggested that the casting dies be redesigned to improve gating and venting. Outcome: the porosity disappeared and the matter was closed.

WE LOVE A MYSTERY. This is one of many actual cases solved by Kaiser Aluminum working with a customer. Perhaps *you* have a mystery one of our technical engineers might help solve? He's ready to give you expert advice on any casting problem—including mold and die design, heat treatment, finishing, fluxing, metal transfer.

FULL ALLOY AVAILABILITIES. Kaiser Aluminum can supply you *fast* with a wide selection of casting alloys to suit any engineering requirement—from general purpose alloys to high purity alloys having good properties at elevated temperatures.

FOR PIG AND INGOT with a free sleuthing bonus, call your nearest Kaiser Aluminum sales office now. Or write to: Kaiser Aluminum & Chemical Sales, Inc., 1924 Broadway, Oakland 12, California.

KAISER ALUMINUM
THE BRIGHT STAR OF METALS

See "MAVERICK" • Sunday Evenings, ABC-TV Network • Consult your local TV listing.

executive vice president and Roy Willison, National Malleable & Steel Castings Co., Cleveland, was re-elected treasurer.

Newly elected directors to serve four years are Elmer E. Braun, Central Foundry Div., General Motors Corp., Saginaw, Mich.; Charles P. Speitel, Pennsylvania Malleable Iron Corp., Lancaster, Pa., and Albert E. Salatka, Marion Malleable Iron Works, Marion, Ind.

Especially honored at the meeting was Carl F. Joseph, recipient of the society's Charles H. McCrea Medal for 1959. Mr. Joseph, technical director, Central Foundry Div., Saginaw, Mich., was recognized for his outstanding contributions to the malleable iron industry. A graduate of the University of Michigan, he has been with Central Foundry and the former Saginaw Malleable Iron Div. continuously since 1922. He has been closely identified with the development of pearlitic malleable iron.

Committee reports occupied most of the first day's business session program. Lyman Whaley, Cadillac Iron Co., Cadillac, Mich., reported on work of the Accounting Committee and its plans for clinics to be conducted during the coming year.

James H. Smith, Central Foundry Div., presented the report of the Finance Committee.

In reporting for the Government Affairs Committee, Collins L. Carter, Albion Malleable Iron Co., Albion, Mich., said that the American Ordnance Association still is

"How about you take one picture of Luigi"

Look at all the work these shell cores save

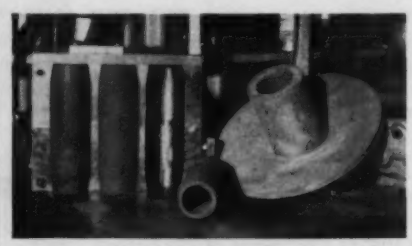
Foundry turns out 20% more gear-case castings with 56% less labor and materials cost

Efficiency up, costs down. That's what more and more foundries find as they switch to shell coring with Durez foundry resins.

This heavy gray-iron gear case once posed a tough coring problem for Golden Foundry Co., Columbus, Ind. Men at Golden used to make the oil-sand core in two halves. They had to jig both halves to the right height, spray them with a refractory finish, and dry them.

Core setters had to center the two halves in the mold with hooks. After pouring, the cores had to be shaken out by hand, and a core knocker used to retrieve the castings.

That wasn't all. Other men then went to work on the castings with hand grinders—smoothing the inside to get rid of the parting line and trimming a fin off the outside.



FOUNDRY TRIPLED PRODUCTION on center-hub core for a variable-speed disk, through change-over to shell process employing Durez resins.

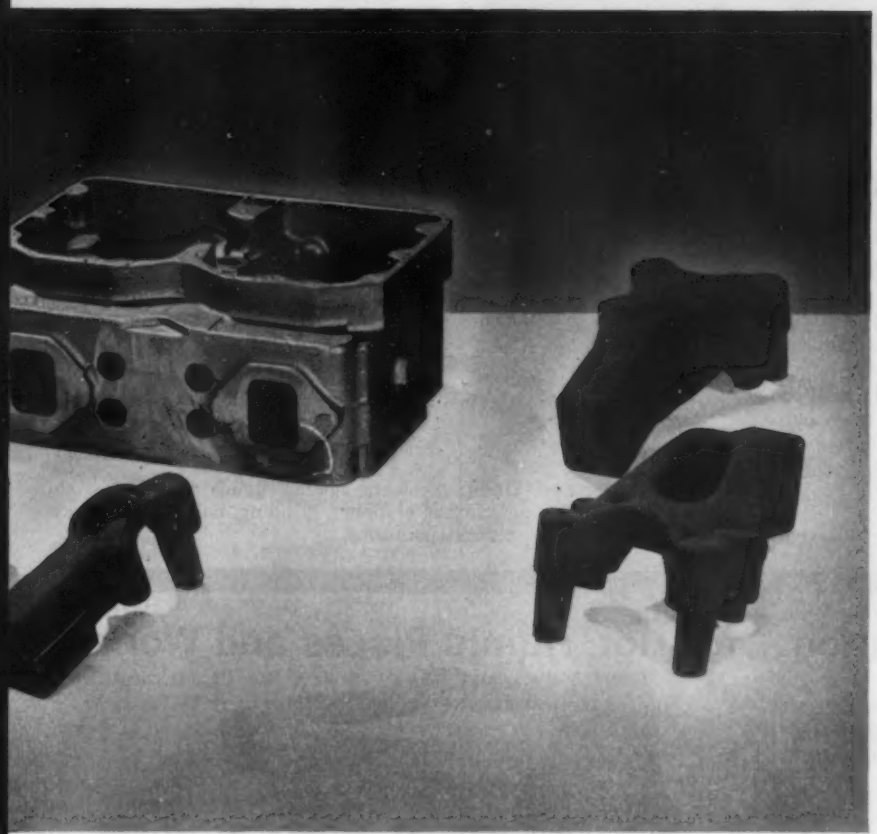
Shell saves man-hours

Now Golden saves practically all this labor with shell cores bonded with Durez resin. There's no need for jigging, spraying, or drying. Core-setting is much simpler. Shakeout is faster and easier. The smooth surface makes it unnecessary to grind the castings inside and eliminates 75% of the outside grinding.

Result: a 20% jump in productivity—*with 56% less outlay for manpower and materials.*

Extra benefits, too

This isn't the only advantage, Golden foundrymen are quick to add. Customers like the savings they make on machining—with the smoother, more accurate castings. Now the foundry can make up advance orders in shell and store them without risk of drawing moisture and blowing. Savings on scrap are substantial: on one job the foundry has run 600 cores with no scrap whatsoever. On another Golden job, 4000 castings were



SHELL CORES bonded with a Durez foundry resin end jigging, spraying, drying; simplify core-setting and shakeout; banish all but a small fraction of hand grinding formerly necessary to finish the casting.

poured without a single core defect.

Why they chose Durez

Golden engineers are candid about the resins they use for bonding shell cores. "We look for the best product at the best price," they declare.

After one full year, evaluating every resin on the market, these men chose Durez.

The advantages they find in Durez resins could be important ones for you. With these resins, you get:

1. Molds and cores of uniformly high tensile strength.
2. Good flowability of sand after coating.
3. Fast cure time to speed molding cycles.
4. Freedom from peel-back.
5. Constant melt point.

Your Durez representative can help you put Durez resins to work in your foundry—profitably. See him soon.

CUSTOMER SAVED 60% on machining when Golden Foundry switched to shell core like this one for a ratchet gear drive. Three machining operations and a heat-treat were eliminated.

DUREZ PLASTICS DIVISION

1007 WALCK ROAD, NORTH TONAWANDA, N. Y.

HOOKER CHEMICAL CORPORATION

HOOKER CHEMICALS PLASTICS

Circle 632 on Page 53

seeking foundry executives for membership on the casting section committee of its Production Techniques Division.

Manuscript of the society's new handbook on malleable iron castings has been completed, it was reported by Leon J. Wise, Chicago Malleable Castings Co., Chicago. Publishing of the book is to proceed shortly.

Robert J. LaMarche, American Malleable Castings Co., Marion, Ohio, discussed activities of the Market Development Council. He also referred to the program of the Malleable Castings Council, which was formed last year by a group of 41 malleable producers to conduct an aggressive advertising campaign.

Other committee reports presented included those of the Membership Committee, given by George T. Boli, Northern Malleable Iron Co., and the Personnel Relations Committee by Robert S. Bradshaw Jr., Texas Foundries Inc., Lufkin, Tex.

Research Projects Are Helpful

Speaking for the Research and Technical Council, Robert V. Osborne, Lakeside Malleable Castings Co., Racine, Wis., said that three major research projects of the society have contributed greatly to the knowledge of malleable iron's properties in the areas of high-temperature applications, machinability, and corrosion resistance.

Additional studies are planned for the future, it was stated by Mr. Osborne and in the report of the society's technical director, Hans J. Heine. These investigations, a number of which will be relatively minor in character, will include the processing of the first set of test plates in the corrosion study, as well as such subjects as sulfur effect on annealing properties, re-evaluation of test bar design, soil corrosion, hot tears, degassing, and welding.

Mr. Heine pointed to the inadequacy of the amount of research work done in the castings industry and emphasized the need for attaining a proper balance between fundamental and practical research. He forecast the opening of new markets for malleable castings, such as in the production of valves, as the result of the society-sponsored

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DOME TYPE SIDE SHIELDS provide up to 15 per cent more ventilation as compared with the flat side shields found on conventional cup goggles. Eyecups are anatomically molded to fit snugly, comfortably around the eyes. Lens retaining rings of aluminum — specially treated to resist corrosion. Ball-chain insulated bridge, curved to fit comfortably. Headband is one-piece rubber and easily adjustable. 50 mm. Super Armorplate or 6 Curve Super Armorplate lenses.

AO 301A Goggle

Recommended Uses: Protects against flying particles striking from any direction in chipping, grinding, babbitting, riveting, etc. and machine operations.

Even More Ventilation...for Hot, Humid Places and Work!

This is the goggle for a man who needs eye impact protection on work around fire boxes, open hearths, oil refinery stills and similar jobs. Note the extension rings which provide almost double the usual ventilation area. Eyecups also have many perforations for ventilation. Like the 301A, eyecups are low set for wide angle vision and won't conduct heat or electricity.

AO 351A Goggle

Fits Over All Rx and Plano Glasses

A welding goggle companion model to the 301A. Yes, fits over side shield glasses, too, with room to spare. Lens shape and size assure up to 20% more vision than similar goggles. Side shields are indirectly ventilated, yet light-tight.

... eyecups are light in weight, opaque plastic

... bridge is high grade leather, easily adjustable.

Headband is all-rubber, easily adjustable. Snap type retaining ring inserts easily from rear, adds to lens security. Goggle is available with adjustable rigid metal bridge as 327R, with rigid bar bridge as 327B.

AO 327A Goggle

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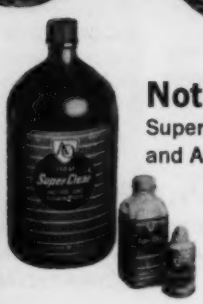

Nothing Finer! AO 350AF
Super-Clear Lens Cleaner and Anti-Fog Fluid

investigation of high-temperature properties of the metal.

The meeting was concluded by a talk by Willy Ley, author, scientist, and rocket expert. Mr. Ley discussed the history, present status, and future prospects of the U. S. space program.

At a subsequent meeting of the Malleable Castings Council, Robert J. LaMarche was re-elected as head of the group and James T. Dougherty, Canton Malleable Iron Co., Canton, Ohio, was re-elected treasurer. Newly elected officers are James Sweeney, National Malleable & Steel Castings Co., Cleveland, vice president, and Thomas J. Kirby, Northern Malleable Iron Co., St. Paul, secretary.

Gratifying results from the council's advertising campaign to date, based on interest developed among casting consumers and design engineers, were reported by Donald B. Sanberg, Malleable Founders' Society, in an analysis of reader surveys and inquiries received.

Book Review

Nuclear Reactor Metallurgy by Walter D. Wilkinson and William F. Murphy, cloth, 382 pages, 6 x 9 in., published by D. Van Nostrand Co. Inc., 120 Alexander St., Princeton, N. J. Price $5.60.

This volume from Argonne National Laboratory's training course in nuclear reactor metallurgy is designed to give engineers and scientists a clear introduction to the field. The treatment primarily is descriptive and qualitative, and assumes no previous training in metallurgy. It covers basic aspects of general metallurgy, phase diagrams and elementary crystallography.

The first ten of the twenty chapters in the book discuss uranium ores and treatment, production of uranium, structure and properties of uranium, uranium alloys, metallography, thermal properties and heat treatment of uranium, fabrication, corrosion, surface protection, and fabrication of fuel elements.

Remaining chapters deal with radiation damage, metallurgy of plutonium, thorium, beryllium and zirconium, the properties of liquid metals in nuclear reactors, ceramics, metallic materials, effects of neutron radiation on nonfissionable metals and alloys, and nondestructive testing of reactor components.

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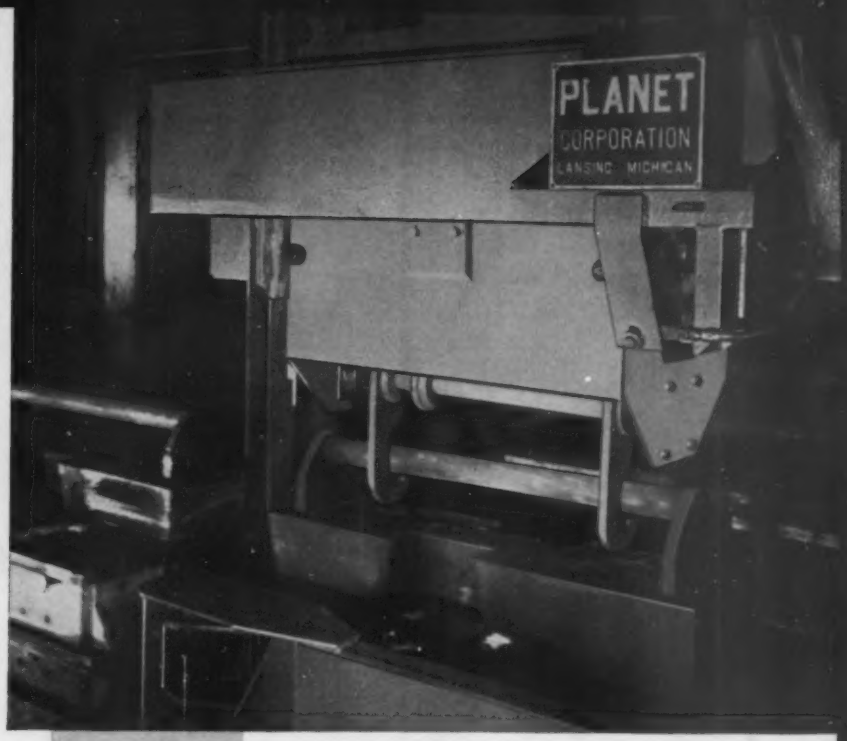

Weight-Shifter, at International Harvester's Indianapolis Truck Engine Works, automatically places weight on mold.

PV

FINDS A NEW WAY TO DO AN OLD JOB...

PLANET WEIGHT-SHIFTER* SPEEDS PRODUCTION, SAVES LABOR BY ELIMINATING HAND CLAMPING

*Patent Pending

Planet Corporation's Weight-Shifter eliminates clamping or manual handling of weights by gently placing weights on top of molds and later removing them . . . this completely automatic operation, capable of accommodating 400 molds per hour, saves time and labor.

As a mold approaches the Weight-Shifter it trips a switch which activates the loader mechanism. The loader hook carriage engages a weight, elevates it, swings it out, and gently and accurately places it on a passing mold. After pouring, the mold passes by the rear end of the Weight-Shifter where the weight is retrieved by a similar operation. The retrieved weight is set on a conveyor within the machine to be carried to the loading end ready for reuse.

The Weight-Shifter is flexible . . .it can be installed on an old line as well as on a new line. Weight discharge height, weight size, vertical dimension, and speed of operation can be adjusted to fit any foundry's operation.

This new way to do an old, manual job is a product of "PV" . . . *Planet Versatility* . . . the quality that has made Planet Corporation known throughout the foundry industry as an organization with solutions to production, materials handling and automation problems. Write or phone for more information about the Weight-Shifter today.

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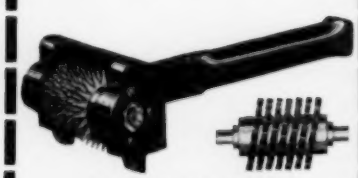
LIVES FOR FOUNDRY GRINDING WHEEL



Desmond Heavy Duty Dresser

DRESSERS

Cut grinding and snagging costs with inexpensive Desmond Hex dressers. They bring grinding wheel faces to "new" efficiency by removing loaded metal and exposing sharp abrasive grains. And Hex dressers provide six sets of bearings in one set of bearing blocks . . . for extra life on average wheels. For resinoid and rubber bonded high-speed wheels use the ball-bearing Desmond Heavy Duty Dresser. Ask your Desmond distributor's advice.

Desmond

Desmond-Stephan Mfg. Co.
Urbana, Ohio

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The Sandman Says

By HAROLD E. HENDERSON
H. C. Macaulay Foundry Co.
Berkeley, Calif.

"The Importance of the Foundry"

● OF ALL human occupations, which must we consider of greatest importance to the welfare of man? Of course, you and I, being a bit prejudiced, might be inclined to give the foundryman top rating. In this assumption, however, we would be slightly in error—not greatly, mind you, just slightly! In even a cursory glance at a book on elementary principles of economics, we learn that the farmer supports us all.

If it were not for this "man with the hoe" (immortalized by Millet's famous painting, which inspired Edwin Markham to create his masterpiece in verse, both of the same title), there would be no man at the muller. Yes indeed, this fellow who is referred to as a hick, rube, cornball, and whatnot by the self-styled sophisticates of our crowded anthills really is a pretty important boy in the scheme of survival.

About the time this nation was founded, at least 75 per cent of our population was engaged in agriculture or some other phase of food production and distribution, and the total population was very small. Today, considerably less than 20 per cent of our people provide food for more than 170 million Americans and others.

How was such a miracle of production achieved? You foundrymen are just too modest to answer! But again, your modesty is justified, at least in my opinion, for I cannot give the foundryman even second place in importance in our civilization.

In my book, the teacher deserves to be seated at the farmer's right as number two man. The teaching profession, with all its auxiliary agencies, including every medium of communication, has become the most valuable business on earth, although it can't function without its daily bread.

In the number three spot, I must honor the medical profession for its achievements. Without the doctor, we never would have to worry about an overpopulated world, but we would have a more tragic situation to worry us. Yet no one honors the farmer more than the doctor, for correct nutrition is better than medicine.

Ranks Foundrymen Fourth—Can foundry practice, the art originally attributed to Tubal Cain, be listed as the fourth most important occupation of man? I for one would like to believe so. Among the innumerable divisions of human labor, surely the metalworker deserves a place high on the list. Yet, fourth honors probably would be disputed by the carpenter or the weaver of cloth or the tailor. Any man who loves his work sees it in a glorified place of first importance.

I thought I had a beautiful argument, in the beginning of this little essay, in support of my foundryman for fourth place among the world's most important providers, but I see that I'm rapidly writing myself out of it. (Either my mix is too weak, or I haven't mulled it long enough.)

According to most economists, food, shelter, and clothing are the primary needs of man, and in that order. Even though the carpenter

.....Today the proudest cars on the road glisten with Olin Aluminum

The exciting Ford Thunderbird is an example. Quality Olin Aluminum is going into the manufacture of most of the fine new cars. Bright, light aluminum resists corrosion, won't rust. No other metal gives car owners such lasting satisfaction. Olin Aluminum, in its first year as a major producer, is already a basic source of supply for the great names in the automotive industry.

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15 WAYS TO SAVE MONEY AND TIME IN THE FOUNDRY

15 NATIONAL BULLETINS describe the most complete line of foundry equipment of its type available *anywhere* . . . to help you make better and more salable castings through:

JOB-TAILORED MATERIALS HANDLING SYSTEMS

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MOLDER'S HELPER

AIR CONVEYOR SYSTEM

DATA BOOK FOR ENGINEERS

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TIME SAVING MIX-MULLER AUXILIARIES

MAINTENANCE MANUAL

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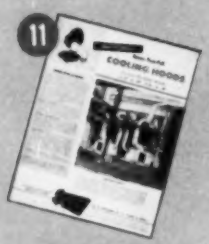

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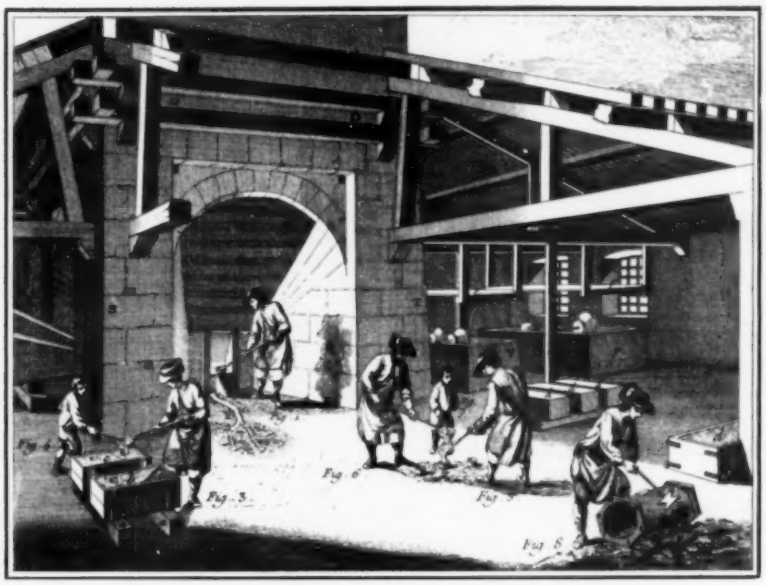
and tailor refuse to give ground to the foundryman for fourth place, I shall defend him with trowel and rammer.

The metalworker made it possible for the farmer, the teacher, the doctor, the carpenter, and the tailor to meet the demands of an expanding and more demanding population.

He gave the farmer a much better plow and other labor-saving

Book Depicts 18th Century Industry



Iron foundry scene in 18th Century France. Molten metal is obtained from the hearth (Fig. 1) and skimmed by boys (Fig. 4 and 7). Worker at right is cleaning section of cast pipe, one of the principal foundry products of the period

● THE metal industries were a subject of major interest to the leading philosophers of 18th Century France. The famous French Encyclopedia, which the finest minds of the French Enlightenment took more than 25 years to complete, devotes scores of descriptive illustrations to a comprehensive survey of metal industries in Europe two centuries ago.

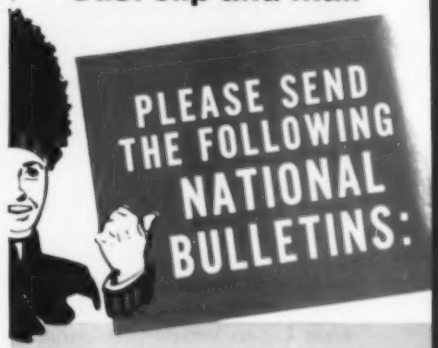
These copperplate engravings, one of which is shown above, have just been reprinted for the first time in more than 180 years, in the new *Diderot Pictorial Encyclopedia of Trades and Industry*, (Dover Publications Inc., 180 Varick St., New York 14; two-volume set, $18.50).

The French Encyclopedia is famous for its part in bringing about the French Revolution, but its authors, led by Denis Diderot, were more interested in industrial revolution. As history's first systematic, illustrated survey of industrial knowledge, it brought about great advances in industrial growth. It was also the forerunner of our modern business and trade journals.

Looking forward to a freer economy, one of the main objectives of the authors was to reveal trade and industrial secrets that had been concealed from outsiders for generations by trade monopolies. The use of coke, for instance, was unknown in France until nearly a century after its discovery by a tight-lipped English foundryman. All the blast furnaces, foundries, copper smelters and other operations depicted in these engravings were operated with wood fires.

Ancient methods of casting, forging, grinding, and stamping are all shown in this panorama of 18th Century industry. Other plates are devoted to the manufacture of metal articles of all kinds, from cannon to cutlery. The publication devotes 84 of its total of 485 plates to the foundry, forging, and other branches of the metal industries.

Just clip and mail



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tools. He made possible the printing-press, which changed the entire technique of the school teacher and introduced the journalist and author to a waiting world. He brought the genius of Shakespeare to a people who were hungry for entertainment, edification, and the solace of the printed word. He provided the doctor with laboratory and surgical instruments and everything that pertains to a modern hospital, lowering the mortality rate, etc. And must I even comment on what the foundryman has done for the carpenter and the tailor?

The story of the importance of the foundryman and his associate metalworkers to the success of the farmer—and hence to all humanity—would require a volume of encyclopedic proportion.

Too Many People?—From 1766 to 1834, the Rev. T. R. Malthus, an Englishman, lived, preached, and wrote. He was a man with a message that amused or startled his own generation and gave those which followed some serious food for thought. He reasoned, "The population of the earth tends to multiply faster than its means of subsistence can be made to do, and unless the increase of population be checked by prudential restraint, extreme poverty is inevitable."

This doctrine became known as the Malthusian Theory. At that time, many people considered it to be pretty logical thinking, and we still haven't been able to laugh it off, for we live in a world stalked by hunger.

Malthus, however, underestimated the potential capacity of the teacher, the farmer, and the foundryman. Having no crystal ball, he could not possibly foresee a tractor replacing the horse and ox, nor could he visualize multiple-disc plows, modern chemistry, atomic power, and the other endless evidences of human genius. In lengthening the span of life by improving our resistance to disease, on the other hand, it would seem that the modern doctor is doing his best to support the contention of Malthus.

In keeping with his usual custom, your old sandman has wandered afield in an endeavor to prove something or other. Let's see, what was it? Oh, yes—that the foundryman has earned fourth place in importance for his contribution to the advancement of civilization and to the sum total of human happiness. Like Hiram of Tyre, he deserves a place at the Lord's right hand. And when an Oscar is awarded to metalworkers, may the man with trowel and rammer be called.

A NEW COST MANUAL

(NO. 2)

for the Gray Iron Castings Industry

Here in 120 carefully planned pages is a complete Cost Account System for both a small foundry with minimum accounting facilities and a large foundry capable of detailed cost determinations for accuracy and completeness.

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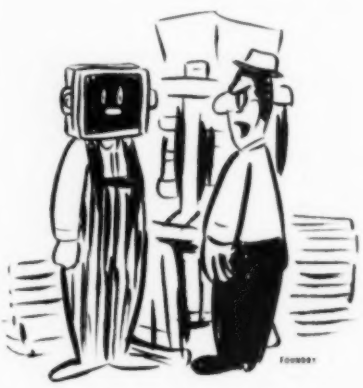

"I told you not to check the machine with the motor running"

HANDY SANDY...

beats a tough assignment in a prominent steel foundry

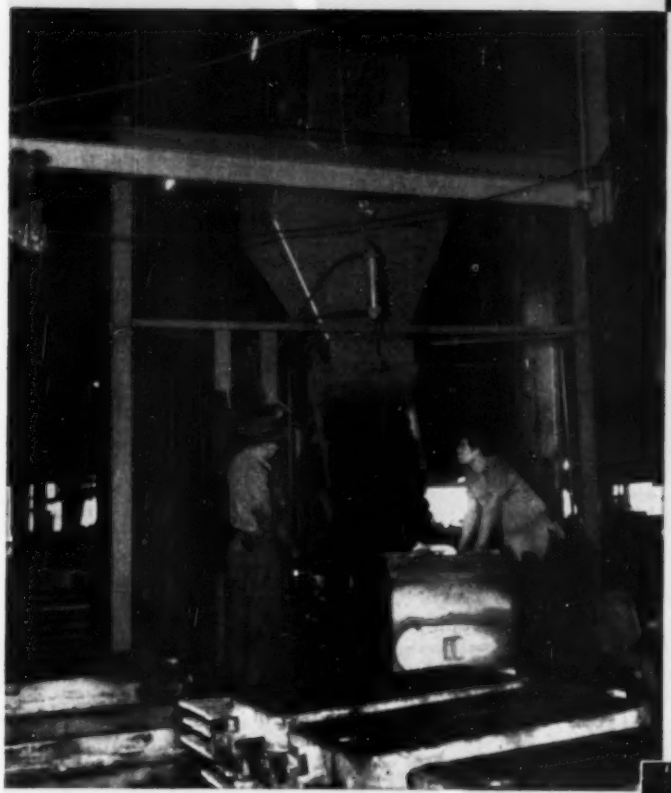

Photo above shows one of the Handy Sandys that provides sand for a large roll over machine.

Photo at right shows one of the Handy Sandys that provide overhead sand for a Cope and Drag operation. With this set-up three men are doing the work of four, and are producing 25% more molds per hour at a large reduction in molding costs.

Newaygo Handy Sandys are a "natural" for steel foundry molding operations. They are engineered like most Newaygo Foundry Equipment — to do a specific job, and do it better.

In this case, these special designed Handy Sandys include as standard equipment Belt-Type Elevators and a special Discharge Baffle on the elevator head to prevent sand from sticking at the discharge point. The overhead Aerator also has separate motor drives to give increased speed as well as aeration to the sticky sand. Removable, hardened aluminum lining is standard in the Overhead Hopper to assist proper flow of sand through the gate.

The two Handy Sandys in this foundry have been in operation for over six months. No trouble of any kind has been experienced in handling the sticky sand. No appreciable amount of maintenance has been required.

"Foundry Business is BIG Business"

Send for your copy of "Planned Mechanization for Foundries."

NEWAYGO engineering company
NEWAYGO, MICHIGAN

...and profitable too, with NEWAY® MOLD HANDLING, SAND HANDLING AND CONDITIONING EQUIPMENT

Circle 639 on Page 53

BRITISH FOUNDRY EXHIBITION

Attracts Wide Interest

By M. M. HALLETT
Managing Director
Chamberlin & Hill Ltd., Walsall, England
European Editor, Foundry

● THE FIRST British foundry exhibition since World War II was held May 21 in Bingley Hall, Birmingham, England. Devoted entirely to the foundry industry, it was organized by the Foundry Trades' Equipment & Supplies Association and opened by Sir Frederick Scopes.

Displays by 97 exhibitors covered a wide range of equipment, processes, and general foundry supplies. Equipment on view illustrated the extent of international co-operation in the supply of modern foundry equipment. Many British firms are engaged in the production of equipment of American, German, Italian, and Swiss origin, just as in many instances British equipment is similarly produced for use overseas.

Molding Equipment — British Moulding Machine Co. showed automatic molding machines with which one operator using two machines can turn out 240 molds per hour. A fully automatic drag turnover machine and standard turnover molding machines also were exhibited. Baker - Perkins Ltd. showed the Taccone diaphragm molding unit and diecasting machines originated by Triulzi, of Italy.

A wide range of foundry equipment was exhibited by J. W. Jackman & Co., much of it in association with Osborn Mfg. Co. These units included a new machine which combines blowing and squeezing of molds. Coleman-Wallwork Co. displayed Shalco shell core machines and electronically controlled shockless jolt-squeeze machines.

The Rubery Owen group also showed an automatic molding machine, of a type which handles small flasks at high speeds. Pneulec Ltd. displayed a new, heavy-duty, jolt-squeeze machine and a unit for blowing or shooting cores and molds. Foundry Plant & Machines Ltd. exhibited for the first time a modified slinger in which the control of movements of the arms is effected by a servomechanism.

Melting Units—Outside the area of molding, Constructional Engineering Co. showed a range of equipment which included various types of cupolas, induction furnaces, a new coreblower, and a continuous, barrel-type shotblast machine. Incandescent Heat Co. Ltd. featured Whiting cupola installations and air heaters for a variety of services. An extensive display of sand treatment equipment was presented by Augusts Ltd. Paterson Hughes Engineering Co. provided examples of a somewhat different type of service. Its exhibit dealt not only with foundry mechanization and cupola charging, but also with material handling systems.

In addition to the exhibits of cupolas, other types of furnaces were shown. Morgan Crucible Co. included both electric and oil-fired crucible furnaces and examples of the crucibles used. Monometer Mfg. Co. presented rotary, semi-rotary, and crucible melting furnaces as well as various holding furnaces. Electric melting furnaces were displayed by Birlec-Efco (Melting) Ltd.

Foundry Supplies—In the area of foundry supplies, Foundry Services Ltd. produced aluminum permanent mold castings to illustrate degassing techniques and mold coatings. Others of their products were demonstrated by working models. Exothermic sleeves and a resin-bonded plaster for production of patterns also were shown. Similarly, Harborough Construction Co. showed materials for insuring melt quality and provided information on a new fast-drying oil for core production. The exhibit of F. & M. Supplies Ltd. also dealt with core oils of extra-fast drying characteristics.

A number of companies showed examples of patterns made from epoxy resins. Leicester Lovell & Co. showed patterns of complicated design, carrying a number of loose pieces, which were made in those materials. G. Perry & Sons Ltd. tended to concentrate on pressure cast pattern plates, but also displayed a pattern plate which had been produced by the Shaw Process because the material could not be machined.

Dust Control — Some exhibitors were concerned especially with foundry working conditions. Grinders by Luke & Spencer Ltd. incorporated dust extraction devices perfected by the British Cast Iron Research Association and the British Steel Castings Research Association. Equipment for freeing cupola exhaust gases of dust were shown by Prat-Daniels (Stroud) Ltd., Incandescent Heat Co., Constructional Engineering Co., George Green & Co., and E. A. Roper & Co. The subject of air pollution is of particular interest in England as a result of passage last year of the Clean Air Act.

The exhibition created great interest and attracted many visitors from abroad as well as from all parts of Britain. Gavin C. Paterson, president of the Foundry Trades' Equipment & Supplies Association, and G. E. Lunt, chairman of the Exhibition Committee, expressed their satisfaction at the over-all response. It is hoped that the success of the show was sufficient to justify its being repeated at three or four-year intervals.

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REFRACTORIES SPECIFICALLY DESIGNED

to meet electric furnace requirements

Because of the versatility of the electric furnace—for primary melting, for duplexing, or for holding—for iron, steel, malleable iron, and non-ferrous metals—a wide variety of refractories are needed to meet the many types of service requirements. For electric furnace roofs, A. P. Green super duty brick, high alumina brick, silica brick, and monolithic refractories have performed outstandingly in many applications.

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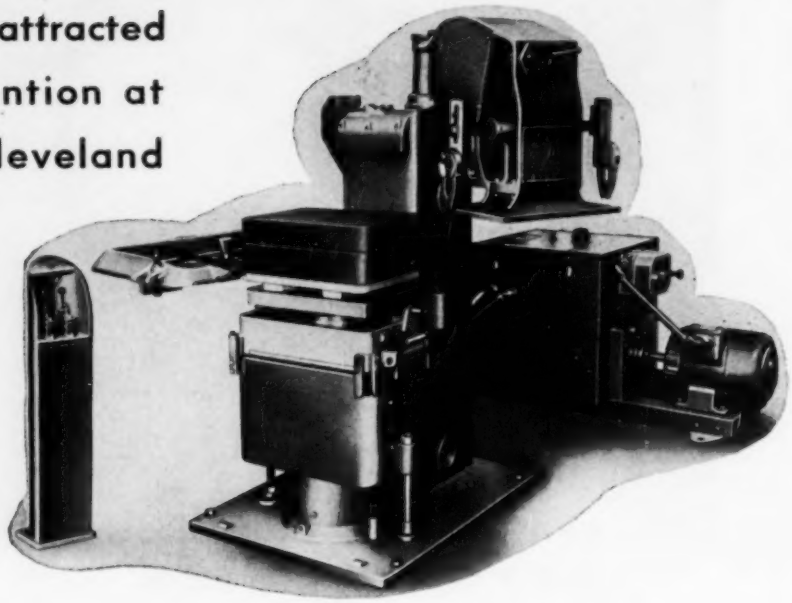
Circle 640 on Page 53

H.E.B.

HYDROIL-ELECTRIC FLASKLESS MOLDING MACHINE

The Machine which attracted your special attention at Foundry Show, Cleveland May 1958.



H.E.B. IS THE ONLY MACHINE OF ITS TYPE IN THE WORLD—

IT FEATURES:—

★ **One man operation** . . . . .

produces complete flaskless mold (cope and drag made simultaneously) in 35/40 seconds—up to 100 molds per hour.

★ **Two standard mold sizes** . . .

17" x 12" on H.E.B.1 and 18" x 14" on H.E.B.2 for high speed production of light castings using double face pattern plates.

★ **3 Second pattern change** . . .

lift out and drop in new plate!

★ **Core setting** . . . . . .

one easy movement.

★ **Independently powered** . . . .

high pressure vane type oil pump unit with remote control.

★ **Minimum maintenance** . . . .

oil operation in closed circuit; non-rusting, non-freezing; no long pipe lines; no pressure loss.

Send for Bulletin 151/NA for full description and diagrams showing unique operating principles.

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Literature for Foundrymen

For More Information Use Reply Card—Page 53

Core and Mold Coating

Folder describes core and mold coatings of different types for use in steel, gray iron, and nonferrous foundries.—**Thiem Products Inc.**, Milwaukee 19, Wis.

For More Details Circle No. 409—Page 53

Diecasting Machine

Bulletin 7A covers special air and hydraulic machines, including a diecasting machine and a press.—**Logansport Machine Co.**, Logansport, Ind.

For More Details Circle No. 410—Page 53

Bench Coreblower

Bulletin 5016 presents features and specifications of a bench coreblower for use with all types of coreboxes and all conventional, high-strength, CO_2, and resin-bonded core sands.—**Beardsley & Piper**, a division of **Pettibone Mulliken Corp.**, 2424 N. Cicero Ave., Chicago 39, Ill.

For More Details Circle No. 411—Page 53

Control Valves

Control valves 1 in. thick by 3 in. wide in $\frac{1}{8}$ and $\frac{1}{4}$ in. sizes; three-way and four-way actions; solenoid, hand lever, and ball actuated types are covered in Bulletin 581.—**Hunt Valve Co.**, Salem, Ohio.

For More Details Circle No. 412—Page 53

Magnesium Alloys

"Magnesium Alloys Improve Aircraft Performance" describes physical and mechanical properties of magnesium castings and other parts for airframe use in aircraft and missiles.—**Magnesium Products Sales Dept., Dow Chemical Co.**, Midland, Mich.

For More Details Circle No. 413—Page 53

Single Bridge Cranes

Bulletin DH-468-B presents data on top running, single bridge, hand traveling cranes in capacities of 1 to 10 tons and in spans up to 50 ft.—**Wright Hoist Div., American Chain & Cable Co.**, York, Pa.

For More Details Circle No. 414—Page 53

Refractory Lining

Five fundamental features of the company's cupola patching and ladle lining material are presented in Bulletin 915.—**Daniel Goff Co.**, Mauricetown, N. J.

For More Details Circle No. 415—Page 53

Oscillating Conveyors

Brochure VB-95 presents operational features of oscillating and vibrating conveyors.—**Prab Conveyors Inc.**, 30121 Groesbeck Highway, Roseville, Mich.

For More Details Circle No. 416—Page 53

Lift Truck Transmission

Brochure covers design and performance features of a dual-range, hydraulically-shifted, constant mesh transmission with integral torque converter. It is intended for use on company lift trucks in the 6000-8000 lb capacity range.—**Hyster Co.**, 1003 Myers St., Danville, Ill.

For More Details Circle No. 417—Page 53

Molybdenum in Gray Iron

Bulletin 8 discusses molybdenum's contribution to uniform strength in gray iron castings. Case histories describe the successful use of molybdenum-containing gray irons in specific applications.—**Climax Molybdenum Co.**, division of **American Metal Climax Inc.**, 500 Fifth Ave., New York 36, N. Y.

For More Details Circle No. 418—Page 53

Cupola Hot Blast

Bulletin 592 describes two types of hot blast cupola air preheaters for temperatures to 1000° F and 1500° F.—**Brown Thermal Products Corp.**, Elyria, Ohio.

For More Details Circle No. 419—Page 53

Hose Clamps

A mechanical clamping method consisting of a lightweight, simple means for connecting various kinds of male and female fittings, ordinary pipe, or mender to a hose is described in Catalog 300.—**Punch-Lok Co.**, 321 N. Justine St., Chicago 7, Ill.

For More Details Circle No. 420—Page 53

Did You Miss These?

Here is a list of popular literature items offered in recent months:

SAND CONTROL ("Sand Conditioning Topics," Vol. 2, No. 1 & 2)—Royer Foundry & Machine Co., Kingston, Pa. Circle 401, Page 53.

FOUNDRY SAND COOLING—National Engineering Co., 549 W. Washington Blvd., Chicago 6. Circle 402, Page 53.

CORE and MOLD BLOWERS—Beardsley & Piper, Chicago 39. Circle 403, Page 53.

GATING REFRACTORIES (Catalog 58F)—Louthan Mfg. Co., East Liverpool, Ohio. Circle 404, Page 53.

METALLURGICAL GAS PROCESSES (Reports 13 to 19)—National Cylinder Gas Div. of Chemetron Corp., Chicago 11. Circle 405, Page 53.

STUDY COURSES—Metals Engineering Institute, ASM, Cleveland 3. Circle 406, Page 53.

FOR THE PATTERNMAKER (Catalog R)—Kindt-Collins Co., Cleveland 11. Circle 407, Page 53.

SPRUE FORMER—Keson Industries, Berwyn, Ill. Circle 408, Page 53.

Chipping Hammer Shanks

Several styles and sizes of pneumatic hammer chisel and gouge shanks for chipping and scaling are presented in Bulletin C-59.—**Bedford Tool & Forge Co.**, 22 Interstate St., Bedford, Ohio.

For More Details Circle No. 421—Page 53

Furnace Refractories

Descriptive data on the company's line of refractory products for industrial furnaces are contained in a booklet on cements, mortars, and coatings.—**Mexico Refractories Co.**, a division of **Kaiser Aluminum & Chemical Corp.**, Mexico, Mo.

For More Details Circle No. 422—Page 53

Airless Blast Barrels

Text, photos, and drawings in Bulletin 705 explain features of component parts and complete heavy-duty airless blast barrels available in several capacities.—**Pangborn Corp.**, Hagerstown, Md.

For More Details Circle No. 423—Page 53

Industrial Ovens

Bulletin 159 covers industrial processing ovens for core baking; stress relieving; normalizing; aluminum solution treating, aging, and homogenizing; and similar processes.—**Hevi-Duty Electric Co.**, Milwaukee 1, Wis.

For More Details Circle No. 424—Page 53

Welding Machines

Bulletin MW-216 presents the company's line of alternating and direct current welding machines in automatic and manual types.—**A. O. Smith Corp., Welding Products Div.**, Milwaukee 1, Wis.

For More Details Circle No. 425—Page 53

Chain

Chain Data Bulletin 59, a chain sample book, illustrates most sizes of 17 types of welded and weldless chain.—**S. G. Taylor Chain Co.**, Hammond, Ind.

For More Details Circle No. 426—Page 53

General Equipment

Material handling and power rectification equipment, mechanical shaft seals, and other equipment and tools are presented in Catalog 591.—**Syntron Co.**, 540 Lexington Ave., Homer City, Pa.

For More Details Circle No. 427—Page 53

Equipment Uses

Booklet, "Performance Briefs," shows typical uses of company's electric fur-

for better castings
CONSISTENT
HI-QUALITY
Cleveland
DOUBLE HEAD
CHAPLETS

Cleveland's wide radius tapered stem shoulders assure solid support . . . allow metal to flow freely for full contact and complete fusion. Instant-fusing knitting rings burn in quickly and evenly . . . provide maximum support during critical fusion cycle.

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Circle 642 on Page 53

naces, cranes, overhead handling systems, and a freight car mover equipped with wheels for road and rail.—**Whiting Corp.**, 15607 Lathrop Ave., Harvey, Ill.

For More Details Circle No. 428—Page 53

Emery Flooring Products

Bulletin 659 describes emery-base materials and brick for paving, patching, and grouting. Bonding and curing agents and a special formulation for heat resistance also are covered.—**Walter Maguire Co.**, 60 E. 42nd St., New York 17, N. Y.

For More Details Circle No. 429—Page 53

Stopper Heads

Second edition of a series of brochures on the care and use of stopper heads describes and illustrates how to assemble stopper bolts, washers, keys, stopper plugs, and sleeves.—**Joseph Dixon Crucible Co., Crucible and Refractories Div.**, Jersey City 3, N. J.

For More Details Circle No. 430—Page 53

Air Compressor

A horizontal, water-cooled, single-stage, heavy-duty air compressor is described in Bulletin 350. Cross-sectional views showing details of component parts are included.—**Pennsylvania Pump & Compressor Co.**, Easton, Pa.

For More Details Circle No. 431—Page 53

Heat-treatable Electrodes

Chemical analyses and mechanical properties of metal deposited by the company's heat-treatable electrodes for welding steels are given in Brochure R-48.—**Harnischfeger Corp.**, Milwaukee 46, Wis.

For More Details Circle No. 432—Page 53

Plant Security

Cost-saving plant security services for manufacturing and process industries are presented in brochure.—**Pinkerton's National Detective Agency**, 154 Nassau St., New York 38, N. Y.

For More Details Circle No. 433—Page 53

Metal Salvage

Folder presents descriptive data and specifications on machines of several capacities for salvaging brass, bronze, aluminum, zinc, lead, and tin from dross, skimmings, and sweepings.—**Steinlein & Kunze**, Koblenz-Metternich, Germany.

For More Details Circle No. 434—Page 53

Pneumatic Conveyor

Brochure describes and gives typical layouts for a pneumatic system of conveying pulverized and granular materials.—**Brady Conveyors Corp.**, 4244 Dempster St., Skokie, Ill.

For More Details Circle No. 435—Page 53

Electric Hoists

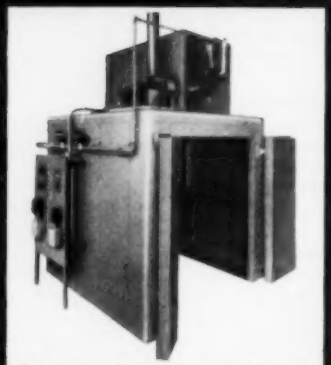
Bulletin H-113 presents ratings, dimensions, and other data on low headroom electric hoists.—**Northern Engineering Works**, 210 Chene St., Detroit 7, Mich.

For More Details Circle No. 436—Page 53

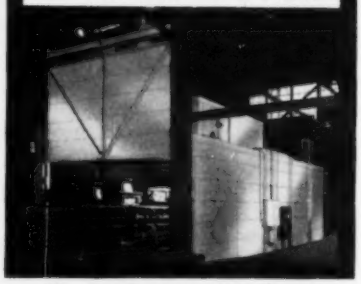
Compressed Air Dryers

Self-contained units for continuous moisture removal with positive water ejection

LANLY heat processing equipment for the FOUNDRY INDUSTRY



from small Rack type Ovens to the BIG CAR TYPE OVENS



If a need arises to replace or improve your Foundry Ovens, it is only logical to look to LANLY, recognized authorities in the design and construction of heat processing equipment for more than 22 years.

TODAY may be the opportune time to survey your present facilities and request the counsel of a LANLY representative at no obligation.

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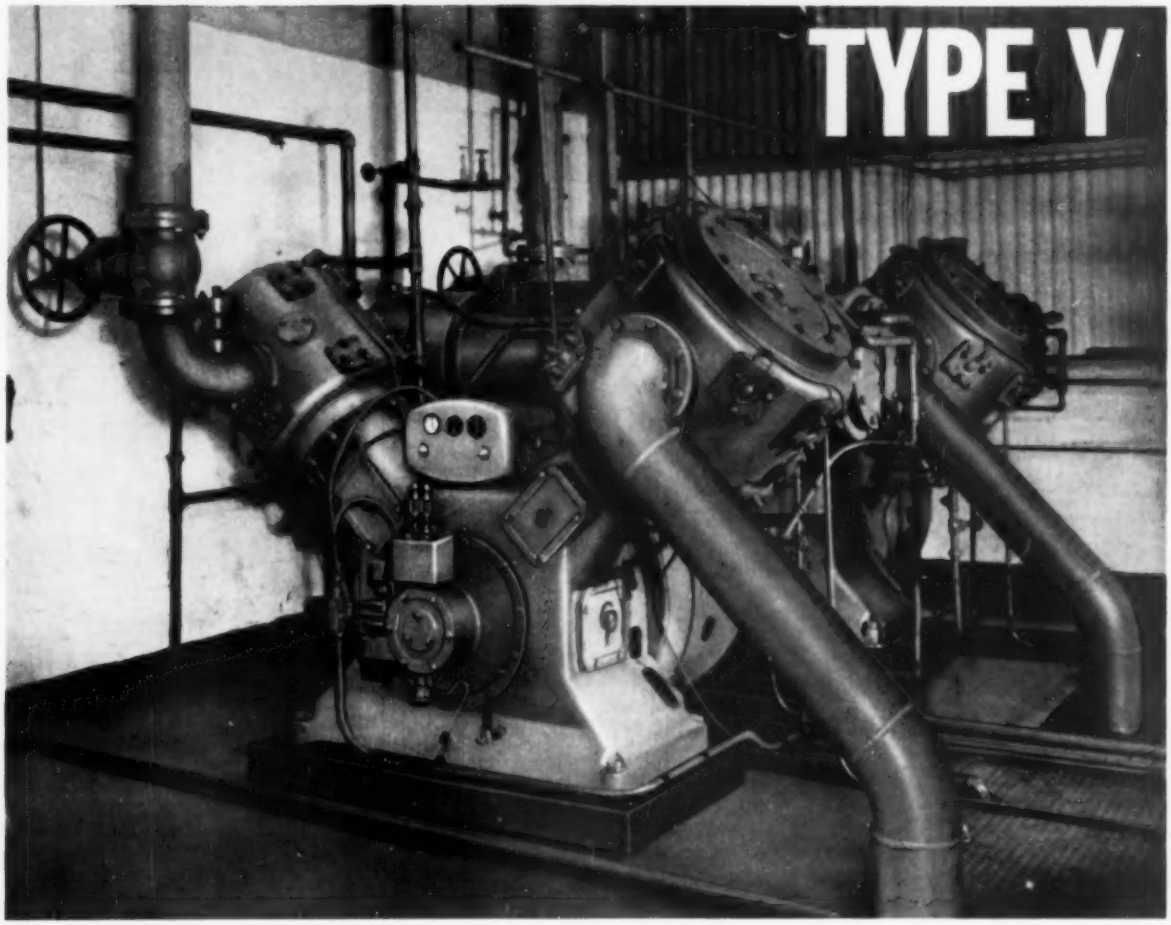
Circle 643 on Page 53

SIMPLE, COMPACT, EASY-TO-INSTALL PACKAGE COMPRESSORS—



Suitable for a wide range of requirements, these well balanced, smooth-operating heavy-duty compressors are available in:

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- Choice of flange-mounted motor, coupled or belt drives

Other CP compressor types available from 7½ to 5,000 hp and pressures up to 15,000 psig . . . all built to provide "around-the-clock" service with minimum attention.

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Circle 711 on Page 53

Built by
HEVI-DUTY
specialists in
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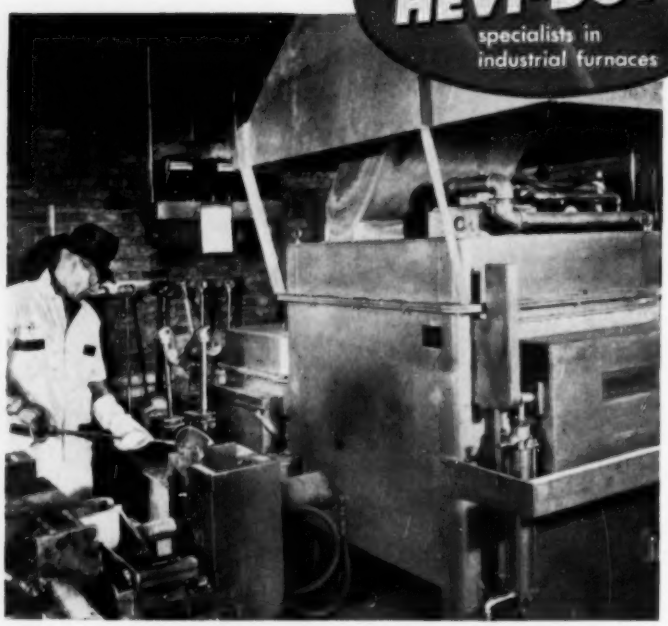

This Combination Melting and Holding Furnace Matches In-Sink-Erator's Requirements

Volume production in limited floor space is one reason why the In-Sink-Erator Company, Racine, Wisconsin, chose a Hevi-Duty Double Chamber Dry Hearth Aluminum Melting Furnace. It covers only 32 square feet of floor space, yet it melts and holds up to 400 pounds of aluminum per hour. The relatively cool furnace exterior has permitted a permanent mold machine to be installed adjacent to the dip-out chamber. In-Sink-Erator, the originator and leading manufacturer of household and commercial garbage disposers, does all of their own permanent molding of disposer shells.

The furnace fits into In-Sink-Erator's time schedule as well as its space requirements. It heats up to operating temperature in only 2½ hours. This means it can be shut down over weekends or at night without excessive loss of production time. Further, the simplicity of this furnace permits minimum maintenance and direct firing provides low fuel consumption.

Write for Bulletin 593 for complete details on Hevi-Duty Melting Furnaces.

- Industrial Furnaces and Ovens electric and fuel
- Laboratory Furnaces
- Dry Type Transformers
- Constant Current Regulators

HEVI-DUTY ELECTRIC CO.
Milwaukee 1, Wisconsin

from the lines are described in Brochure S-100. Also seven-page Data Sheet No. 1 discusses the problem of moisture in compressed air lines.—**Technical Designs Inc.**, 119 Northfield Rd., Bedford, Ohio.

For More Details Circle No. 437—Page 53

Electric Furnaces

Carbon and Graphite News, Vol. 6, No. 1, May, 1959, presents an article on six-electrode arc melting furnaces.—**National Carbon Co.**, a division of **Union Carbide Corp.**, 30 E. 42nd St., New York 17, N. Y.

For More Details Circle No. 438—Page 53

Air Motors

Bulletin 215 covers features, specifications, and dimensions of air motors for the five bore sizes available in each of four mounting types. A section showing

accessories and an explanation of how air motors work are included.—**Hannifin Co.**, Dept. 238, 501 S. Wolf Rd., Des Plaines, Ill.

For More Details Circle No. 439—Page 53

Variable Speed Pulleys

A line of variable-speed pulleys designed to eliminate freezing and sticking are described in Bulletin 4101. Data are included on sheaves designed for ratings of 2, 3, 5, 10, and 15 hp.—**R. B. Wood's Sons Co.**, Chambersburg, Pa.

For More Details Circle No. 440—Page 53

Grouting Practices

Bulletin E1d discusses common methods of grouting different types of equipment and explains how to avoid shrinkage through use of properly applied nonshrink grout.—**Master Builders Co.**, Cleveland 3, Ohio.

For More Details Circle No. 441—Page 53

Foundry Refractories

Proper selection of refractories to meet the exacting needs of foundry operation is discussed in booklet, "Refractories for the Foundry Industry."—**A. P. Green Fire Brick Co.**, Mexico, Mo.

For More Details Circle No. 442—Page 53

Sling Chain Care

Booklet, "Vital Links to Safety," illustrates and discusses fundamental practices to insure maximum sling chain safety.—**McKay Co.**, 1005 Liberty Ave., Pittsburgh 22, Pa.

For More Details Circle No. 443—Page 53

INTERNATIONAL HAS DONE IT AGAIN!

MOLDING MACHINE COMPANY
LA GRANGE PARK, ILLINOIS

A MATCH PLATE MOLDING UNIT that takes the "Back-break" out of those BIG JOBS—operated by 2 men on long or short runs, NO SPECIAL RIGGING OR SPECIAL FLASKS, 750 lbs. capacity—for up to 24" x 36" "snaps". This Is The Unit for those Large, Awkward match Plate Molding jobs

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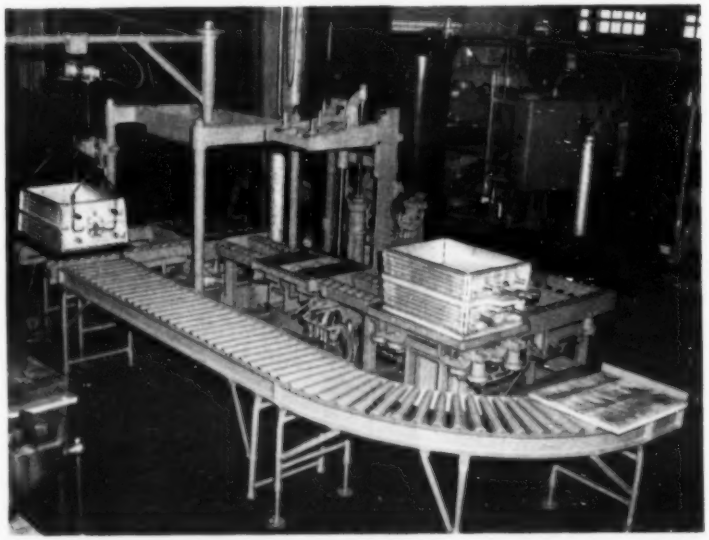

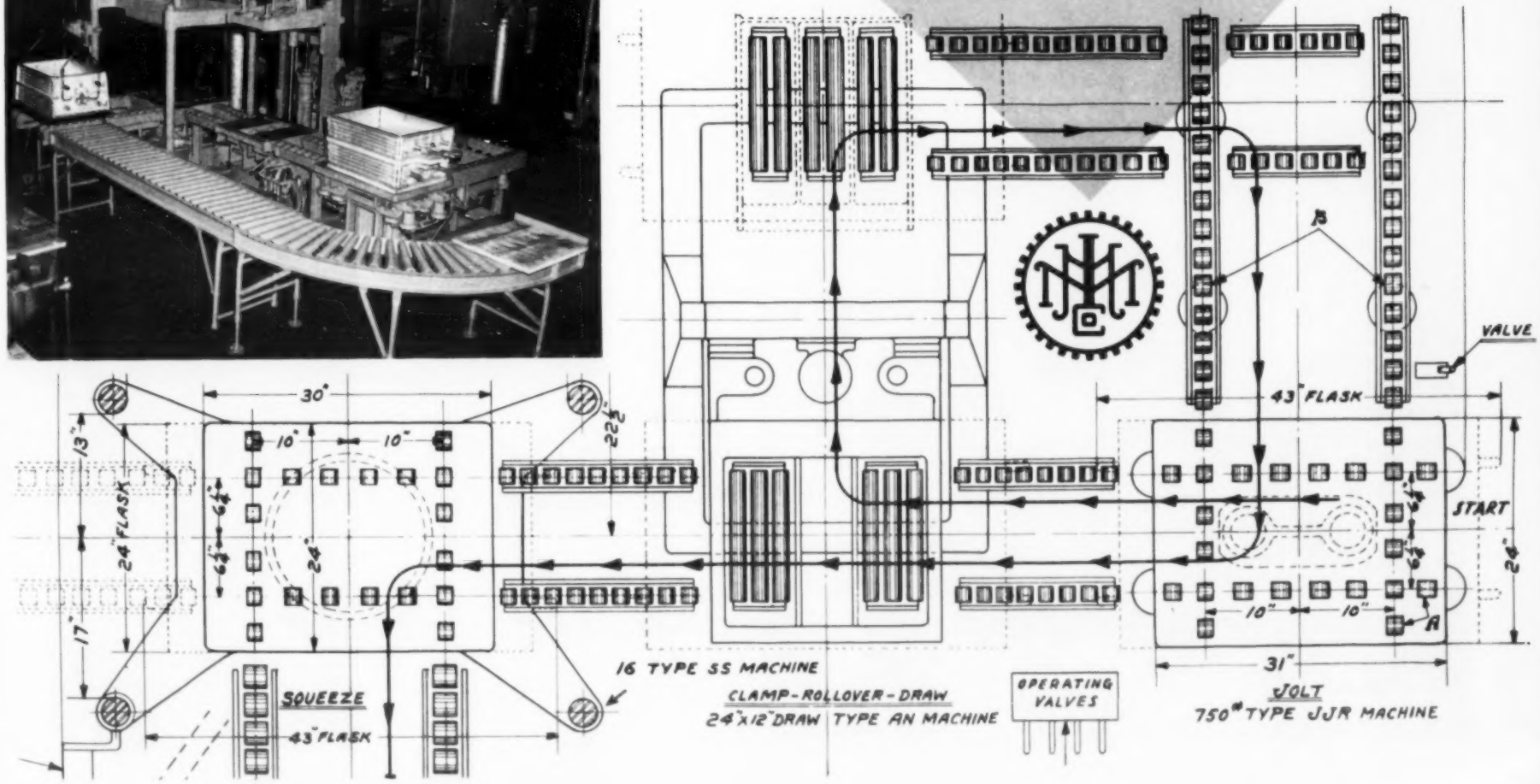

Circle 646 on Page 53

Prof. Roy Schroeder meets his foundry engineering students at the University of Puerto Rico and passes out copies of the texts to be used in the course

Puerto Rico Expands

Engineering Education

By ROY W. SCHROEDER
Associate Professor
Foundry and Pattern Laboratory
Navy Pier Branch
University of Illinois, Chicago

● THE COMMONWEALTH of Puerto Rico has embarked on a program of education, including engineer and foundry training, that should set an enviable record and provide an example for other countries.

In 1939-40, enrollment in the public schools in Puerto Rico, including the University of Puerto Rico, was 297,000, whereas in 1955-56 it reached 673,000. The expenditure for education was $7 million in 1939-40 and $51 million in 1955-56. In the commonwealth's 1955-56 budget, 26 per cent of the total was spent for educational purposes.

The main campus of the university is at Rio Piedras, and the College of Agriculture and Mechanic Arts is situated on 400 acres of rolling hills and landscaped grounds on the outskirts of Mayaquez, the third largest city of Puerto Rico.

The college has an enrollment of between 3500 and 4000 students and a faculty of more than 300. Students and teachers come from all parts of the world. Recruiting a competent faculty in this era of scarcity is a major problem, but the way it has been attacked belies the *manana* tradition associated with Latin American countries. Heads of departments are continually on the lookout for competent

Partial view of the university's new building for the engineering school

From a pile of sand to a rigid mold in 4 minutes

Core for automotive spring hanger

Sodium Silicate-CO_2 Process

You can produce cores in a matter of seconds with the sodium silicate-CO_2 process. With this quicker core-making technique, a binder based on Du Pont Sodium Silicate is mixed with fine core sand . . . CO_2 is the curing agent.

During gassing, CO_2 reacts with the sodium silicate to form a tough gel that hardens while sand is in *direct contact* with patterns. Strong, high-tolerance cores are produced . . . yet collapse easily during shake-out.

The sodium silicate-CO_2 process offers production-line speed . . . eliminates the need for drying and baking equipment. Cores are ready for metal pouring *immediately* after curing. The over-all production cycle is faster. And foundry workers prefer CO_2 molding because there are no objectionable fumes.

Ask your foundry supplier for full details about this time- and money-saving process, or write us for names of suppliers of binders based on Du Pont Sodium Silicate. *E. I. du Pont de Nemours & Co. (Inc.), Industrial and Biochemicals Dept., Room N-2543, Wilmington 98, Delaware.*

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Steps in CO_2 core-making process . . .

1. Standard muller is used to mix sodium silicate-based binder and core sand.

2. Mixed core sand is tamped into form, then packed with pneumatic rammer.

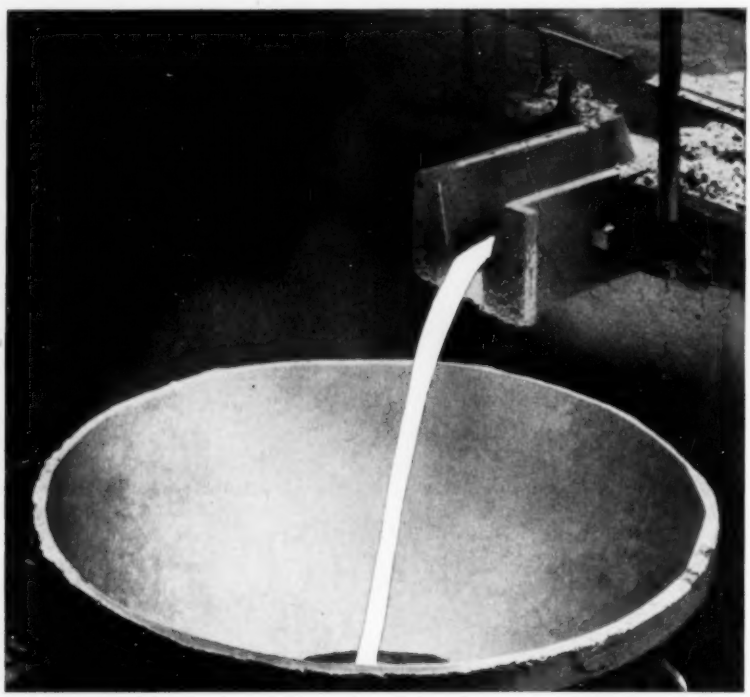
3. Packed core mold is placed over CO_2 jet and quickly cured by gassing.

4. Cured cores are **immediately** ready for metal pouring.

Circle 647 on Page 53

FOR AREAS WHERE MOLTEN IRON IS ON THE MOVE

Porter Anti-Slag, the plastic refractory that gives longer lining life under severe slagging



Cupola spout areas, ladles, runners . . . wherever molten iron is moving . . . that's Anti-Slag territory! Anti-Slag Plastic, companion refractory to Porter's famous Slagtite, gives you highest resistance to your tough slagging conditions.

Refractories with graphite, pioneered by Porter's Laclede-Christy Works, provide cleaner metals, less refractory inclusions and cut casting scrap. Now, Anti-Slag adds easier slag cleaning and reduces "wetting," particularly in areas where oxidation and carbon pick-up are not factors. Periodic washing with Porter Slagtite Mortar and Coating will add even longer life to Anti-Slag.

Let us help you determine the *proper* graphite refractory (Slagtite or Anti-Slag) for your application. Available in plastic or dry form. Write: *Refractories Division, H. K. Porter Company, Inc., Porter Building, Pittsburgh 19, Pa.*

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instructors and travel quite widely to search for them.

Building Program—Before classes can be taught efficiently, buildings must be built and classrooms and laboratories furnished with modern equipment. Consequently, the college is experiencing the biggest building program in its history.

An accompanying illustration shows a partial view of the six-story building completed for the school of engineering in 1958. This building will house administration offices, an auditorium, large lecture rooms, and some laboratories. Several new structures will be added within the next few years, including a student center and a library.

On July 26, 1958, ground was broken for a new building to house the Puerto Rican Nuclear Center. The shovel used by Dr. Milton Eisenhower, president, Johns Hopkins University, was forwarded to the Nuclear Center on behalf of the people of Oak Ridge, Tenn. The shovel contained a small Cobalt 60 source. This radioactive material transmitted a signal to the new site a half mile away. When the shovel was put into a box of earth brought to the new engineering building from the proposed site, it started the construction machinery.

New facilities at the center will include a reactor building, a laboratory building, a greenhouse, a service room, and various auxiliary facilities.

Engineering Shop Laboratories—These will be housed in a one-story building and will include the foundry laboratory, the welding laboratory, and a laboratory for study and research involving machine tools. Manufacturing processes courses will be taught in this building. Generally listed as sophomore subjects in the states, they will be given in the fourth year of a five-year engineering program. Time for the study of these important subjects will be increased to one-third more than that allotted for the same subjects in most U. S. colleges.

Foundry Laboratory—The writer feels honored that he was asked to help establish the foundry section of the manufacturing processes courses. This task involved preparing a list of equipment and facilities needed to set up this lab-

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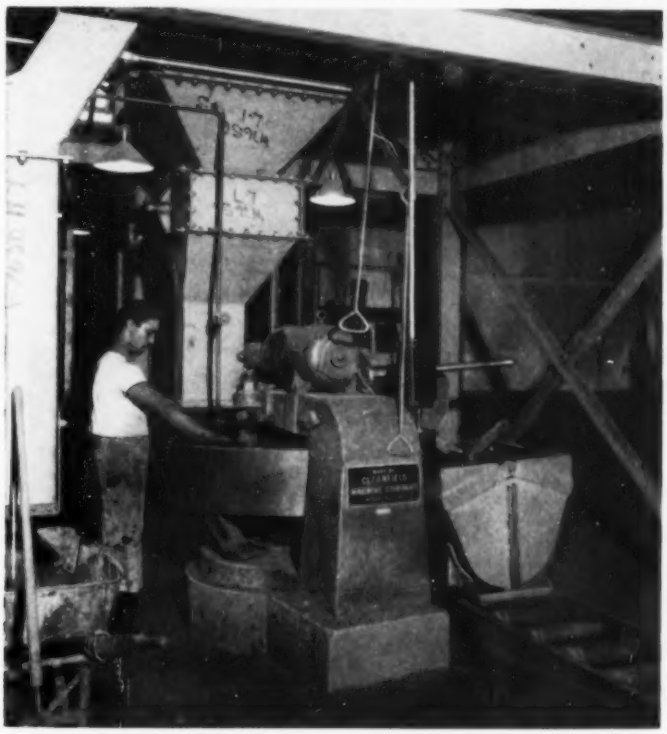
"Il successo e la straordinaria diffusione delle molazze 'Clearfield' in Italia e nei Paesi di esportazione, confermano l'indiscussa superiorità di queste macchine."



More proof that Clearfield Mixers are popular everywhere!

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Among the reasons for the popularity of Clearfield mixers, according to the Italian company, are (1) the great *adaptability* of the mixers—to any plant, and for a variety of uses (2) their high *efficiency* . . . of power consumption as well as production output, and (3) their high safety factor.

Other users praise Clearfield Mixers for their speed, thoroughness, economy, service-free performance. Whether *your* need is for a mixer that affords a better balance of mixing, blending and tempering . . . maximum output with minimum use of power . . . economy from the standpoint of durability and ease of maintenance and operation . . . or a size that will fit your particular installation . . . you will find the machine to meet your requirements *exactly* at Clearfield.

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Circle 649 on Page 53

oratory properly, holding informal training meetings with faculty members to discuss what should be done and taught, and providing general advice as seemed necessary. Through correspondence, the preliminary work was well under way before I left the U. S., and a lot of supplies, literature, and class material were on order or on the way.

A sample of sand that the college had endeavored to use was tested and found deficient on all counts. Since it was the best natural sand available, it was decided to use a synthetic or blended sand. Consequently, the first piece of equipment ordered and also the first to be received was a sand muller. Silica sand was made available from a chinaware plant.

Akron International, an aluminum foundry, furnished, through D. A. Rampe, a fine bonding sand and enough bonding and parting material so that we could make a few simple molds to acquaint the teacher and the laboratory technicians with molding techniques, teach them how to operate the furnace, and explain melting practices.

Course Work—Some small wooden flasks were made for temporary use until steel and tapered snap flasks arrived. Steel molding and core benches were built by the technicians. Because of the advanced standing of the students and the additional time available, the foundry section was made to include much of the material usually offered in regular foundry courses in the mechanical engineering curriculum in this country.

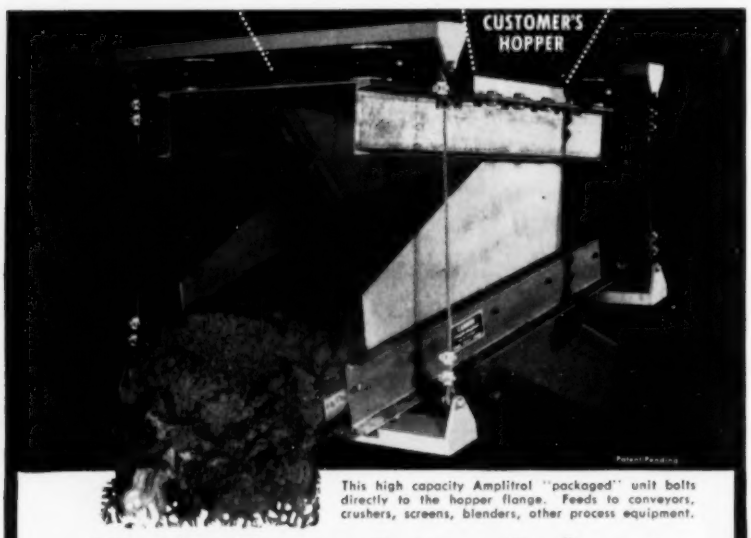
Course Work Is Varied

Reports covering all the melting furnaces, molding machines, sands and sand testing apparatus, modern production methods and controls, elementary metallurgy, and pattern and casting design are required as part of the semester's work. Modern theory and practices on these points will be covered in lectures by judicious use of movies, quizzes, and magazine articles on foundry practices. The four-hour lab period allows the instructor to give a short lecture and demonstration, a working period in the shop, and a review of the material covered to check the progress of the day and to correct mistakes.

This schedule makes an ideal teaching situation and speeds progress. Any scrap produced during the period may be discussed with the group and suggested changes noted so that steps can be taken in the next period to correct the mistakes. This method trains students to analyze their work and teaches them to reach logical solutions to their problems. Because the work is done as a group, all students profit by the study. They learn the value of co-operation to solve common problems in casting production.

The plan for the future includes study and research in special alloy irons and steels. Electric furnaces with extra shells will be used to avoid contamination. Under this proposed plan, students from the college will be in demand and will do much to advance the use of cast metals and play an important part in the economic development not only of their country, but of all of Latin America.

A statement by the Economic De-



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velopment Administration says, "Under our industrial development program approximately 100 new factories are being organized each year, and by 1960 we expect to have a total of 800 new plants (in a recent release, about 2500 are expected by 1975). As a result, the demand for trained supervisory, technical, and managerial personnel will increase at an unpredictable rate. If we are to cope with this demand, we must be prepared to offer well trained Puerto Ricans as candidates for key positons."

At present, there are about 100 metalworking plants on the island, including 26 foundries (production and jobbing), diecasting, extruding, and stamping plants, and rolling mills. The writer visited a few and found them on a par with our own. Tools, dies, melting equipment, production, and quality of product would rank with our best.

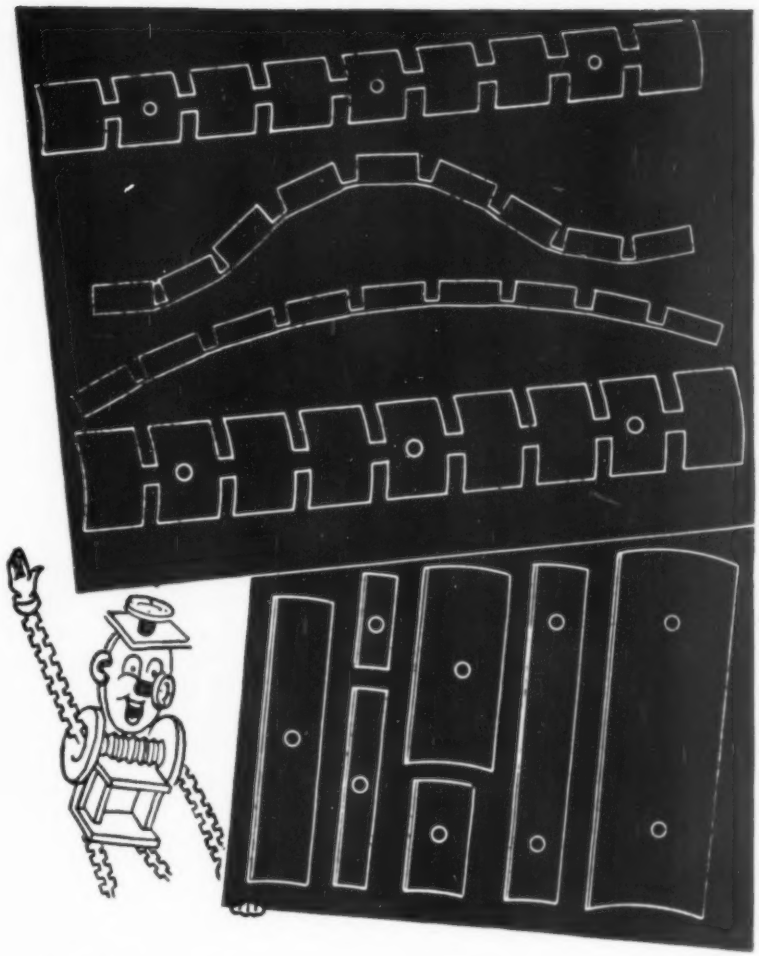
Akron International, for example, is a small but well laid out, high-production aluminum foundry. It employs complete sand conditioning and handling equipment, roller conveyors, continuous pouring, and shell cores. Interstate Engineering operates an up-to-date diecasting plant.

In this rapidly expanding economy, which in a comparatively short time will encompass Central and South America, the foundry industry will find a prominent place. The university recognizes this fact and is determined to help meet the challenge.

Industry in the U.S.A. and in the commonwealth have contributed generously in time, material, and literature whenever asked. It is with a deep feeling of gratitude on the part of the university and myself that I wish to thank all who have given a helping hand in the launching of this new program.

New Foundry for South Africa

A new foundry is planned at Que Que, Southern Rhodesia, by City Engineering & Carron Ltd. It will make various types of gray iron sanitary ware, pipes, and fittings. The foundry will be housed in a building being dismantled in Germiston, South Africa, for shipment to Que Que, a distance of approximately 700 miles.



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Around the Country

NEWS REPORTS FROM

Chicago . . . Philadelphia . . . Pittsburgh

Pittsburgh—Foundries that supply the railroads, automakers, steel mills, and machinery builders are enjoying the best business they've had in more than a year.

Most shops are operating 40 hours a week; some are scheduling overtime and Saturday work. Backlogs of steel foundries average about six weeks, but at least one firm has enough business booked to keep it running at a 40-hour clip for the balance of the year.

Sales of one of the largest and most diversified foundries have been increasing at the rate of 5 per cent a month since January. Quotes that were made 60 or 90 days ago are coming to light as steel mills buy castings for maintenance and repairs.

With the marked pickup in business, prices have firmed appreciably. Whether they'll be increased this year will depend in part on the outcome of contract negotiations with the United Steelworkers. "If we have to raise wages, customers will understand our need for price relief," one foundryman declares. Says another: "Business is getting better, but it isn't good enough to permit higher prices before the first of the year. If employment costs go up, we'll have to absorb the increases."

Pittsburgh Steel Foundry Corp., with 1800 employees and plants at Glassport and McKeesport, Pa., has been purchased for $5.5 million by Textron Inc. The foundry has had average sales for the last five years of $15,670,000 and average pre-tax earnings of $1,140,000. Founded in 1898, it makes heavy machinery and castings for the steel industry, valve manufacturers, and railroads. It will be operated as a division of Textron, with no changes contemplated in methods, management, policies, or personnel. Although it's a major factor in the textile industry, Textron has 14 metalworking divisions.

Philadelphia— A seasonal dip in castings production is forecast for July and August. Low point for the entire year probably will be reached in July, with various shops closed one to two weeks for mass vacations, and with hot weather also likely to slow production. A mild recovery in August but no appreciable gain until after Labor Day is expected.

June was a fairly good month for most foundrymen. Gray iron shops averaged 75 to 80 per cent of normal capacity for perhaps the best showing so far. Malleable shops were quite busy and nonferrous shops fairly active. Steel casting business continued to lag, although some foundries managed to get up to a five-day week with restricted working forces.

Gray iron jobbers report a continued lack of heavy work, and those specializing in machine tool castings declare the going still is rough. Various shops, however, have been working five days a week —more in some cases—and with full forces. Power transmission work, tobacco machinery, air compressor parts, material handling specifications have all contributed to a good market for many founders. Miscellaneous building supplies also have helped, although pipe shops at the moment are not too active.

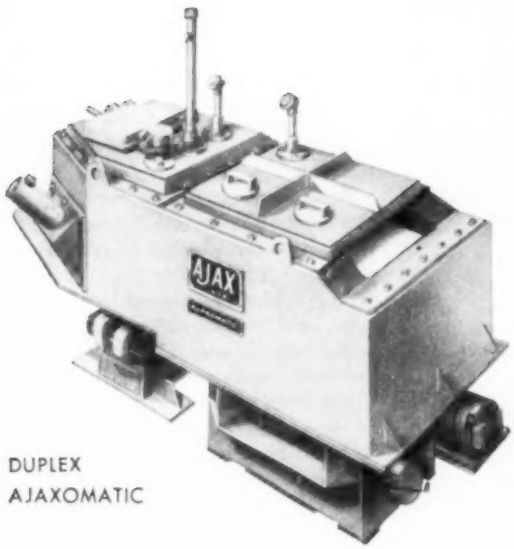
Pipe fittings and building and in-

PLANT TOUR—A tour of the Philadelphia Coke Div. plant climaxed the popular 16-week training program conducted by the Education Committee of Philadelphia Chapter, AFS. Thirty men representing most of the local area foundries completed the course, the third sponsored by the chapter for member firms. E. X. Enderlein, committee chairman, is shown first row left, and E. Saks, foundry instructor, Dobbins School, is at far right. Also in first row are plant guides H. DeHoll, second from right, and H. Cluley, fourth from right. (Courtesy Ed Klank, Philadelphia Coke)

CAN WE STILL AFFORD HAND-LADLING?

AJAXOMATICS

bring automation to die casting



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Automation, however, is only part of the AJAXOMATIC story. The Duplex AJAXOMATIC also gives assurance of consistent quality. The quality of a finished casting begins with the proper melting of the metal. 60 cycle induction with its two basic features of internal heating and electromagnetic stirring is used exclusively in the Duplex AJAXOMATIC. Here are the unique characteristics of the Duplex AJAXOMATIC:

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The standard Duplex AJAXOMATIC is rated 120 kw to produce 500 lbs per hour of castings ranging from ½ lb to 30 lbs. Other AJAXOMATICS are available to suit a wide range of production requirements, including units supplied from central melting systems. May we have an opportunity to study your requirements?

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Circle 652 on Page 53

EQUIPMENT TODAY FOR THE CHALLENGE OF TOMORROW

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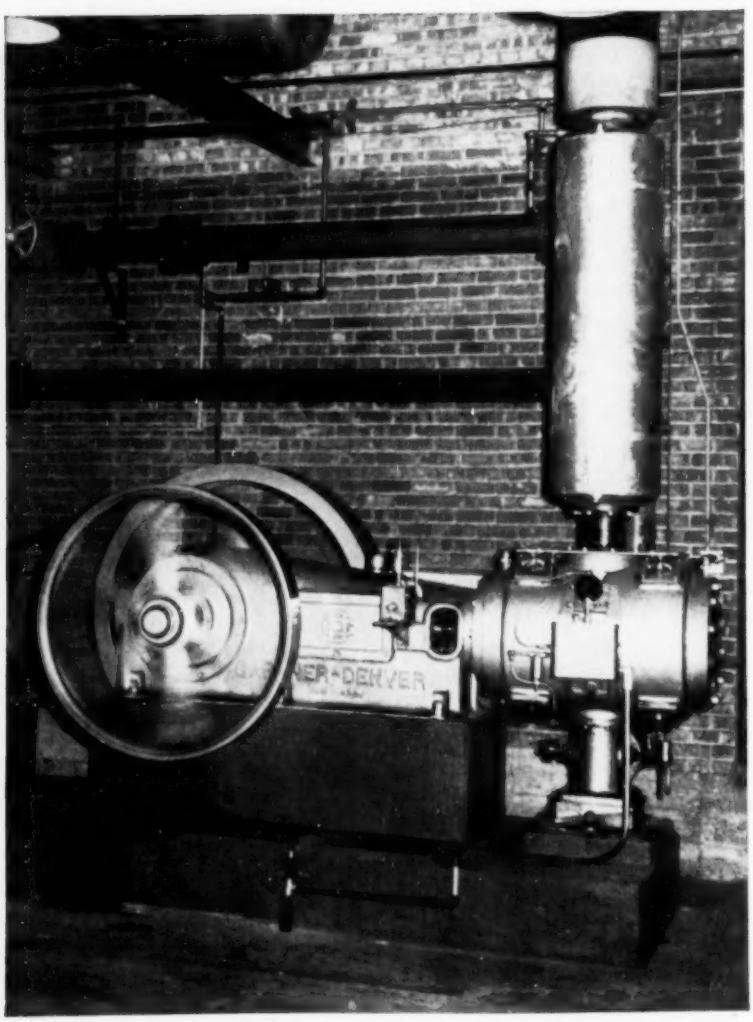


dustrial hardware requirements feature the malleable market, with shops in this category operating at least a full five-day week.

Steel casting producers feel particularly the lag in heavy industrial equipment demand. It is doubtful if recent operations have averaged over 60 to 65 per cent of normal. Backlogs remain low, three weeks in some cases.

Nonferrous jobbers are experiencing a good demand for plumbing supplies and electrical equipment components. Independents are also benefiting by some overflow from the captive shops of water meter manufacturers, but not much from those in other lines. Maritime work has been relatively light and business in industrial pumps has reflected particularly the unsettled situation in oil. In general, however, nonferrous shops (independent and captive alike), are doing well, although unable to build up backlogs. Aluminum sand foundries are busy.

Chicago—Cook County Board of Commissioners on May 25 took the wraps off its new zoning ordinance proposal and set June 29 for the first public hearing before the County Zoning Board of Appeals.

The plan is designed to cope with the postwar population explosion in suburban Cook County. It is a tough restrictive program that spells out land uses in an area inhabited by 1.4 million people. It allocates areas for residential, commercial, industrial, and manufacturing use and it incorporates as one of its major features performance standards based on extensive research for controlling industrial and manufacturing nuisances.

Foundries located in the suburban area will want to keep informed on the new ordinance. It is expected that the ordinance—with changes or modifications—will be submitted again to the County Board by early fall for approval.

Meanwhile, in another move on June 2, suburban health officers, concerned over growing concentrations of people and industry, called for enactment of state assembly legislation to allow formation of air pollution control authorities throughout Illinois. They favor the

Circle 653 on Page 53

passage of a state air pollution law.

It was pointed out that although Chicago has an air pollution control ordinance, it cannot be enforced outside the city limits. The proposed state authority would have taxing powers, issue permits, and make inspections of potential air contaminating installations. It is said that 17 states have some kind of air pollution law.

* * *

The government-owned Ford Motor Co. Aircraft Engine Division plant in Chicago, which last January completed its contracts for manufacture of the Pratt & Whitney J-57 jet engines for the U. S. Air Force, will revert to the General Services Administration July 1 and the agency probably will put it up for sale.

The history of the plant was detailed in this column in March FOUNDRY, p. 160. The plant has a large magnesium foundry which suspended operations in mid-1954 and was mothballed. Some of the foundry equipment has been sold since that time but the bulk still is intact.

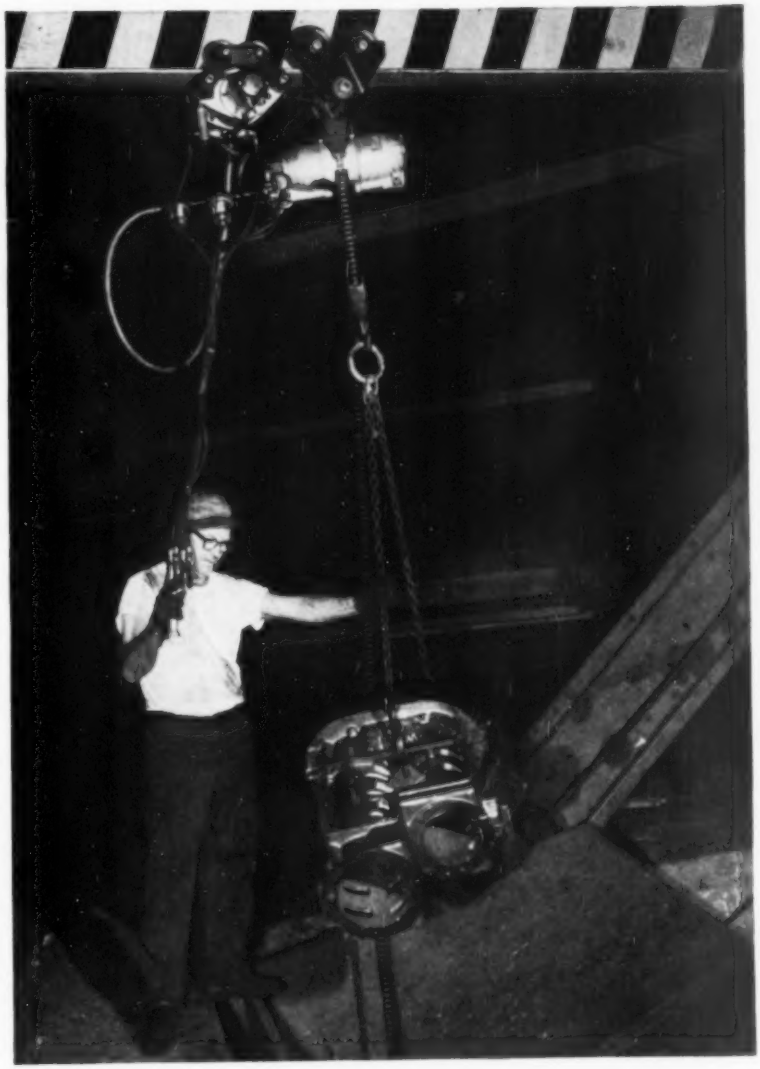
* * *

As announced briefly in FOUNDRY for June (p. 35), a threatened strike of 3000 AFL-CIO foundry workers in Chicago, Aurora, Joliet, and Batavia, Ill., was averted in May when the Chicago Foundrymen's Association and the union reached agreement on a new two-year contract incorporating a 19-cent an hour pay raise in two steps.

A 10-cent increase retroactive to May 4 raised journeymen molders' and coremakers' rates to $2.67 an hour and laborers' to $2.02. Another 9-cent raise will go into effect May 1, 1960. The only fringe benefit change was the addition of jury duty pay.

The contract was negotiated between the association, representing 28 foundries, and Local 233 of the International Molders and Foundry Workers union. The expiring contract had been for three years.

Some 32 other foundries in the Chicago area follow the wage pattern established in the association agreement. Three foundries—larger, jobbing gray iron shops—negotiated a three-year agreement, providing for a wage rate and insurance reopener in 1961.



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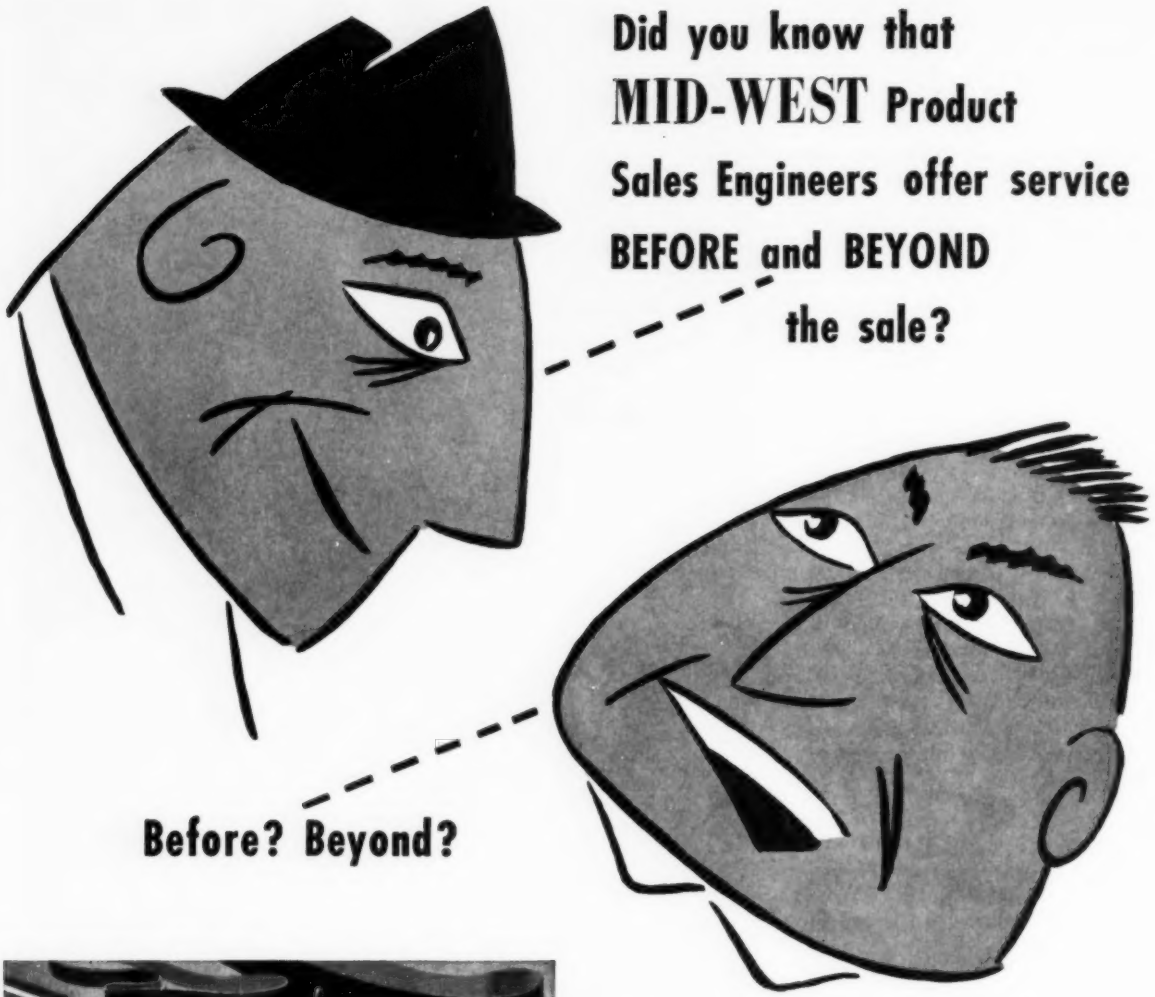

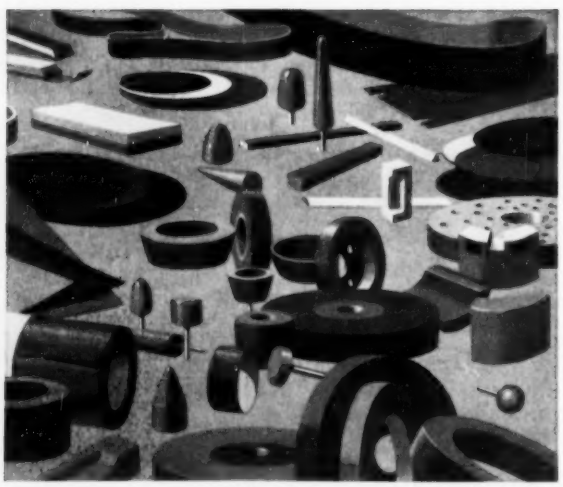

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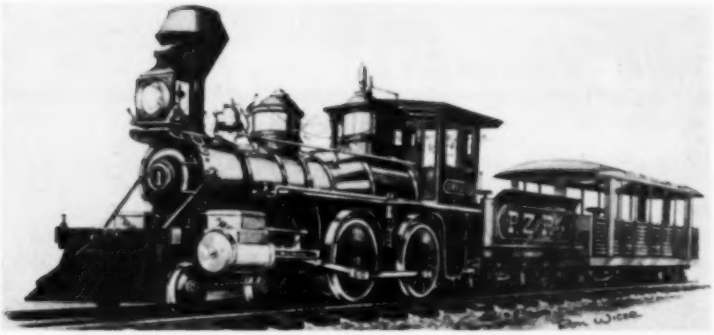


The steam locomotive at the new city zoo in Portland, Oreg., will be a 5/6 scale model of the Baldwin engines that operated during the 1870s

Carwheels for the Portland Zoo Railroad train were supplied by Electric Steel Foundry Co., Portland

Foundrymen Help Zoo Get

OLD-TIME TRAIN

By BILL WALKINS
Electric Steel Foundry Co.
Portland, Oreg.

● THANKS to the ingenuity and persistence of a Portland businessman and hobbyist and the co-operative effort of pattern shop and foundry members of Oregon Chapter, American Foundrymen's Society, a steam locomotive with four cars will soon be added to the rolling stock of the Portland Zoo Railroad.

A streamlined train built by Northwest Marine & Iron Works and Hirschberger Sheet Metal Co. has been in operation since the railroad started about a year ago. The 1¼-mile line was built as part of the original plan for the new city zoo.

A 2½-mile extension now being constructed through Washington Park is financed by sales of stock at $1 a share which entitles the stockholder to a free ride on the train and the title of honorary engineer. More than 10,000 individuals and hundreds of firms have donated time, money, and materials.

The city of Portland has allotted $25,000 for railroad purposes out of the $4 million zoo construction fund. But, the tireless promoters of the zoo railroad have parlayed this into a property that, when completed, will have physical assets worth several hundred thousand dollars and a recreational and tourist attraction value that should be up in the millions.

When certain nostalgic citizens began beating the drum for a real, old-fashioned steam train, their cries were heard by George Burton of Sherman-Clay Co. who had done ten years of research on design of steam locomotives. Burton designed the locomotive—a 5/6 scale model of the Baldwin engines that operated in 1870 to 1875—and the four cars, which will be open-side excursion models of the same era. The train will accommodate 120 adults or 160 kids.

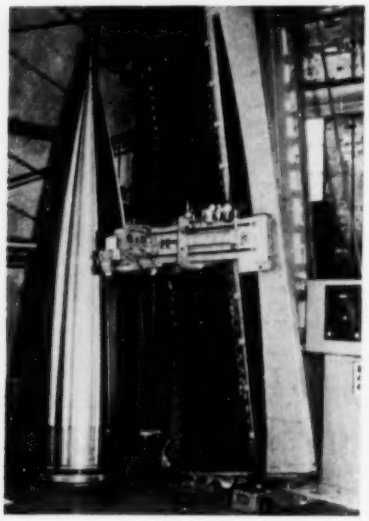
Al Sears, Crawford & Doherty Foundry Co., shows off an assortment of patterns for the locomotive castings

Most of the castings for the train are iron, a few being made of steel and a lesser number of brass. Mr. Burton found Portland pattern shops eager to make the patterns, and foundries likewise willing to produce the castings. Magnesium and aluminum founders were doomed to disappointment since the train is an exact replica of those of eighty years ago when the light metals were virtually unheard of.

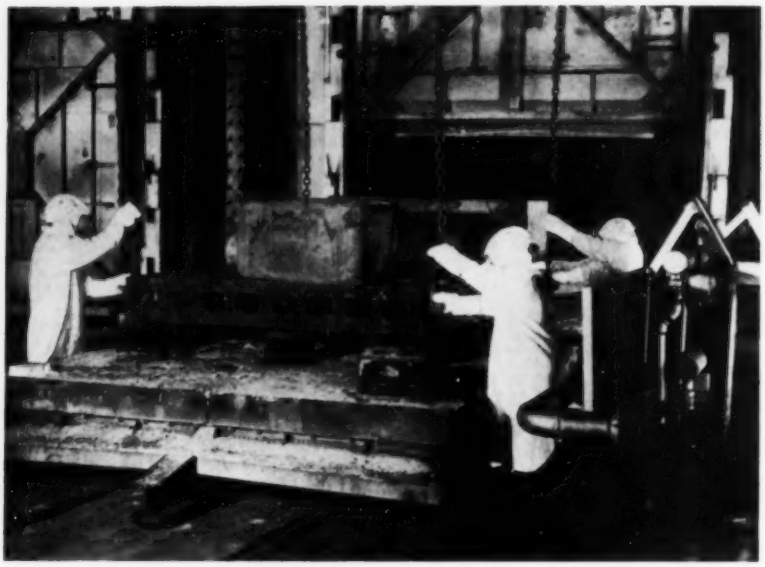
It is hoped that the train will make its initial run during this summer's Oregon Centennial celebration. At the Centennial grounds, a 3600-foot loop of track has been laid, and the railroad will operate there during the summer. The income will help finance the extension of the railroad from the zoo through Washington Park.

Next fall, when the train is fired up for its first zoo run, foundrymen and patternmakers will swell out their chests with justifiable pride as the real steam-powered locomotive chugs its way through the West Hills of Portland, its melancholy whistle stirring vivid recollections of the past and the early days of American railroading.

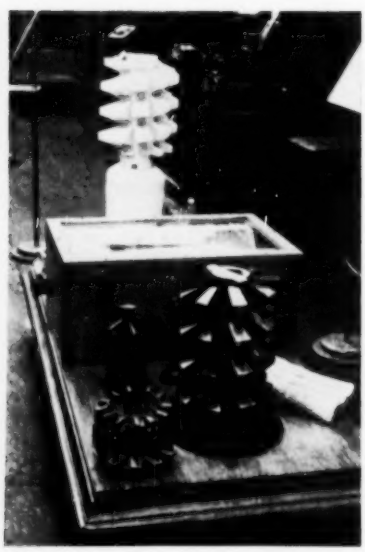
News Views



MANDRELS: Meehanite metal mandrels cast by Palmyra Foundry Co., Palmyra, N. J., are being used to form fiberglass radomes for the U. S. Strategic Air Command. Fiberglass filament is wound continuously on a mandrel and heat cured. The mandrel is 12 ft long and weighs 12,000 lb



FOUNDRY PHANTOMS: Furnace operators at the East Chicago, Ind., plant of Blaw-Knox Co. resemble ghosts as they handle a steel casting coming out of a heat treating furnace. Temperature in the furnace is more than 1600° F. The men are attaching chains to the steel pallet which supports the casting. An overhead crane will transport the casting to a water-quench tank



MADE IN RUSSIA: Taken in Moscow at the year-round Agricultural and Industrial exhibition, this picture shows a display dealing with investment casting. The wooden case contains a die, shown in cross section, which was made by the investment process

FIGHTING AIR POLLUTION: Research-Cottrell Inc., Bound Brook, N. J., recently sponsored a day-long seminar on air pollution control and industrial gas cleaning in New York to discuss current and future needs in the battle against air pollution. James M. Knox, president of the firm, told the seminar that industry currently is spending at the rate of $500 million annually in that fight, and he predicted that this amount will double within 10 years

IT'S UP TO YOU!
NEED A MAN?
. . FROM AN OUTSTANDING ENGINEERING SCHOOL
. . WITH ENGINEERING STUDY IN CAST METALS
. . AND, SUMMER WORK EXPERIENCE IN FOUNDRY
. . WHO IS LOOKING FOR A CAREER IN CAST METALS
E COLLEGE

Whether he comes from the Metallurgical, Mechanical or Industrial curriculum, the FEF graduate is the product of one of the Nation's top ranking engineering institutions.

In addition, the FEF graduate has enjoyed the advantages of studying foundry as an engineering process and cast metals as an engineering material in a modern foundry laboratory under the instruction of well-known engineering educators.

Familiar with the realistic applications of engineering theory through summer student employment in foundries, FEF graduates bring to the industry a practical engineering approach.

All FEF registrants—whether Voluntary or Scholarship—have expressed a firm interest in our industry and a desire to explore its career opportunities. This desire, based upon training and experience, helps to assure our industry of a valuable source of capable and enthusiastic technical talent.

These PLUS FACTORS make the Big Difference—and set the FEF graduate engineer apart from his fellow students as a potentially outstanding foundryman.

To learn how the FEF is creating this source of technical talent, write for our booklet "Let's Look Ahead".

Foundry Educational Foundation

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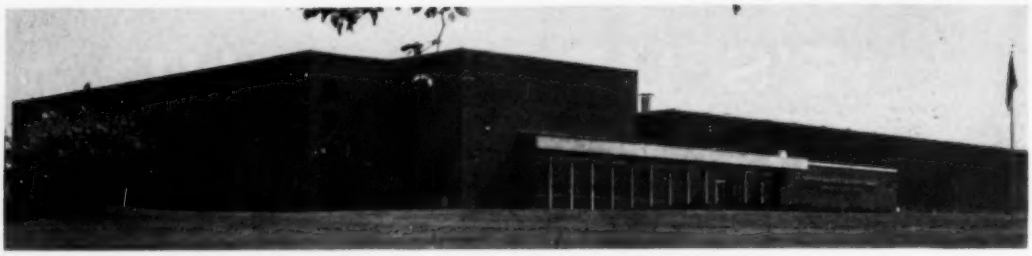
Circle 656 on Page 53



Garber Research Center of Harbison-Walker Refractories Co., Pittsburgh

Completes New Center for

REFRACTORIES RESEARCH

● A $2 million investment in the search for better refractories was unveiled last month by Harbison-Walker Refractories Co.

The occasion was the opening of the company's new and highly modern Garber Research Center, situated on an attractive 21-acre site on the southern outskirts of Pittsburgh. It was named in honor of Earl A. Garber, Harbison-Walker's president since 1948, under whose administration much of the company's expansion has taken place.

The laboratories, providing 45,000 square feet of working area, consist of two main buildings separated by a handsome courtyard. One building houses offices and instrumental research; the other is occupied by a pilot plant for product research and development.

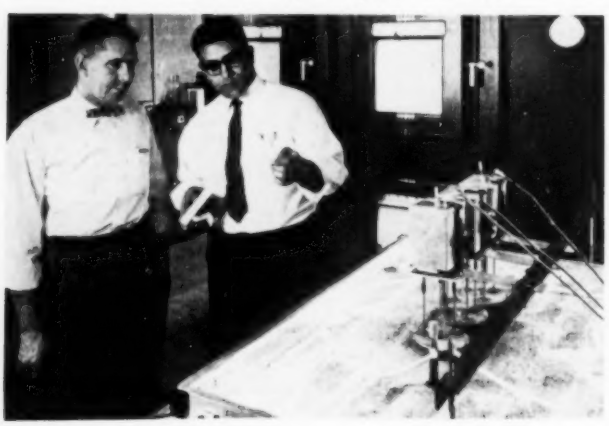
Study of the changes which take place in refractories during service is carried on with a variety of equipment. In addition to an analytical chemistry laboratory, facilities include petrographic equipment, emission and x-ray spectrographic units, an x-ray diffractometer, and specialized equipment for measuring particle size and physical properties of refractory materials.

The pilot plant building contains all equipment associated with the manufacture of refractories and a kiln area for heating and testing refractories. It also includes several specialized laboratories for the development of such products as refractory mortars, castables, and monoliths. Adjoining the pilot plant area are sections devoted to routine physical testing of refractories.

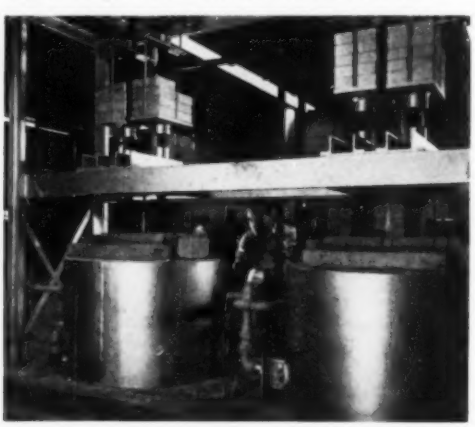
Harbison-Walker established its first research laboratory in 1905 and has actively pursued product development work since then. Among recent fruits of this research activity are a refractory brick and bonding mortar designed to offset the corrosiveness of new alloying ingredients in aluminum melting. Another is a magnesite-dolomite refractory developed for lining vessels used in the new oxygen steelmaking process. A third is the adaptation of basic brick to the open-hearth furnace roof, with consequent increases in steelmaking temperatures and furnace capacity. Of particular interest in the development of refractory concrete is the use of such material on the launching pad at Cape Canaveral and on the warm-up aprons for jet aircraft.

Management group at the Garber Research Center is headed by Donald F. Stock, laboratory manager, and Dr. Edwin Ruh, assistant director of research. Donald F. King is assistant laboratory manager. Harbison-Walker's director of research is Raymond E. Birch.

This special apparatus was designed to provide accurate data on the thermal expansion of brick



Furnaces used for testing refractories under load are part of extensive testing facilities



Coming in the September issue: A special report on . .

heat treatment

of cast metals

FOUNDRY magazine announces another editorial report of major significance. Here, all in one issue, September 1959, will be practical information that offers you new approaches to your heat treating problems. This special editorial report will cover the Solidification and Heat Treatment of . . .

- ALUMINUM and MAGNESIUM ALLOYS
- STEEL and MALLEABLE IRON
- GRAY IRON, DUCTILE IRON and ALLOY IRONS
- COPPER-BASE ALLOYS
- PLUS . . . A GENERAL REVIEW OF PRINCIPLES

These five areas will be covered in detail by well-qualified authors. The report will be fully illustrated with photographs that examine the latest ideas, methods, and theories of heat treatment. Here's another FOUNDRY feature that you won't want to miss!

SEPTEMBER ISSUE OF

FOUNDRY

A PENTON PUBLICATION

Men of Industry

ELMER E. BRAUN

CARL A. KOERNER

Appointed by Central Foundry Div., GMC

JOHN G. STEINEBACH

JERRY CAPRIO

promotions at A. P. Smith Co.

Elmer E. Braun has been named divisional manager of ferrous metals operations under GMC's recent consolidation of the Fabricast plants with Central Foundry Div. Formerly works manager of the division, he will head operations in Saginaw, Mich., Defiance, Ohio, and Danville, Ill. **Carl A. Koerner,** manufacturing manager at Central Foundry Div., has been made director of sales and engineering at all five plants of the expanded division. **Edgar A. Wondracheck,** formerly Fabricast manufacturing manager, has been appointed manager at Bedford, Ind., with the Jones Mills, Ark., plant reporting to him. **George A. Zink** continues as manager of Fabricast plants in Bedford and Jones Mills and will serve as manager of light metals programs. He was general manager of the former Fabricast Div.

Frank Coolbaugh has been appointed president, Climax Molybdenum Co. Div., succeeding **Weston Thomas,** who has been elected executive vice president of the parent organization, Climax Molybdenum Co., New York. Mr. Coolbaugh is also a vice president and director, Climax Molybdenum Co. of Michigan.

Albert W. Lang has been made foundry superintendent of Universal-Rundle Corp., Camden, N. J. He formerly was chief metallurgist.

George Nixon, formerly superintendent, Newton Foundry Co., Newton, Iowa, has been appointed assistant foundry superintendent, Brillion Iron Works Inc., Brillion, Wis. **Arnold Brown** has been made metallurgical process supervisor. He was laboratory supervisor, Ingersoll-Humphryes Div., Borg-Warner Corp., Mansfield, Ohio.

Edward O. Falberg has been named division manufacturing manager, Bohn Aluminum & Brass Corp., Detroit, in charge of operations at the bearing plant in Greensburg, Ind., and the facility in Holland, Mich. **Carl F. Brown,** has assumed Mr. Falberg's former duties as plant manager of the Greensburg plant. Mr. Brown was assistant to the plant manager there.

George W. Hottel has been named staff assistant in the general sales and market planning department, Diamond Alkali Co., at the Cleveland home office. **Jack G. Redmond,** field salesman in Cincinnati, has succeeded Mr. Hottel as New York branch sales office representative.

F. H. Sherman has been elected president and general manager, Dominion Foundries & Steel Ltd., Hamilton, Ont. **A. G. Wright** has been named vice chairman-finance, and **F. A. Loosley,** vice chairman-research and development.

Jerry Caprio has been appointed manager of engineering, and **John G. Steinebach,** assistant plant superintendent, A. P. Smith Mfg. Co., East Orange, N. J. Mr. Caprio, whose duties will include product and industrial engineering, joined the company in 1929. Mr. Steinebach, a graduate of Purdue University, has been with A. P. Smith since 1955. He is a director of the Metropolitan Chapter of the American Foundrymen's Society.

Samuel R. Parry, formerly vice president-general manager, Chattanooga Div., Combustion Engineering Inc., New York, has been named vice president-manufacturing for the company, succeeding **Robert M. Hatfield,** who has become vice president-general sales manager in charge of domestic sales. **Harry J. Bolwell,** assistant general manager, has been made general manager of the Chattanooga Div.

James R. Brown Jr. has been appointed director of manufacturing, Dresser Industries Inc., Dallas. He was manager of foundries, Baldwin-Lima-Hamilton Corp., Eddystone, Pa.

Dr. Reinhardt Schumann Jr. has been named head of the School of Metallurgical Engineering, Purdue University, Lafayette, Ind., succeeding **Dr. E. H. Comings,** who will be dean of engineering at University

A Completely Self-Contained High-Frequency Induction Melting Unit That Can Be Installed In 2 Hours

Ideal for Air or Vacuum Melting, Sintering and Hot Pressing

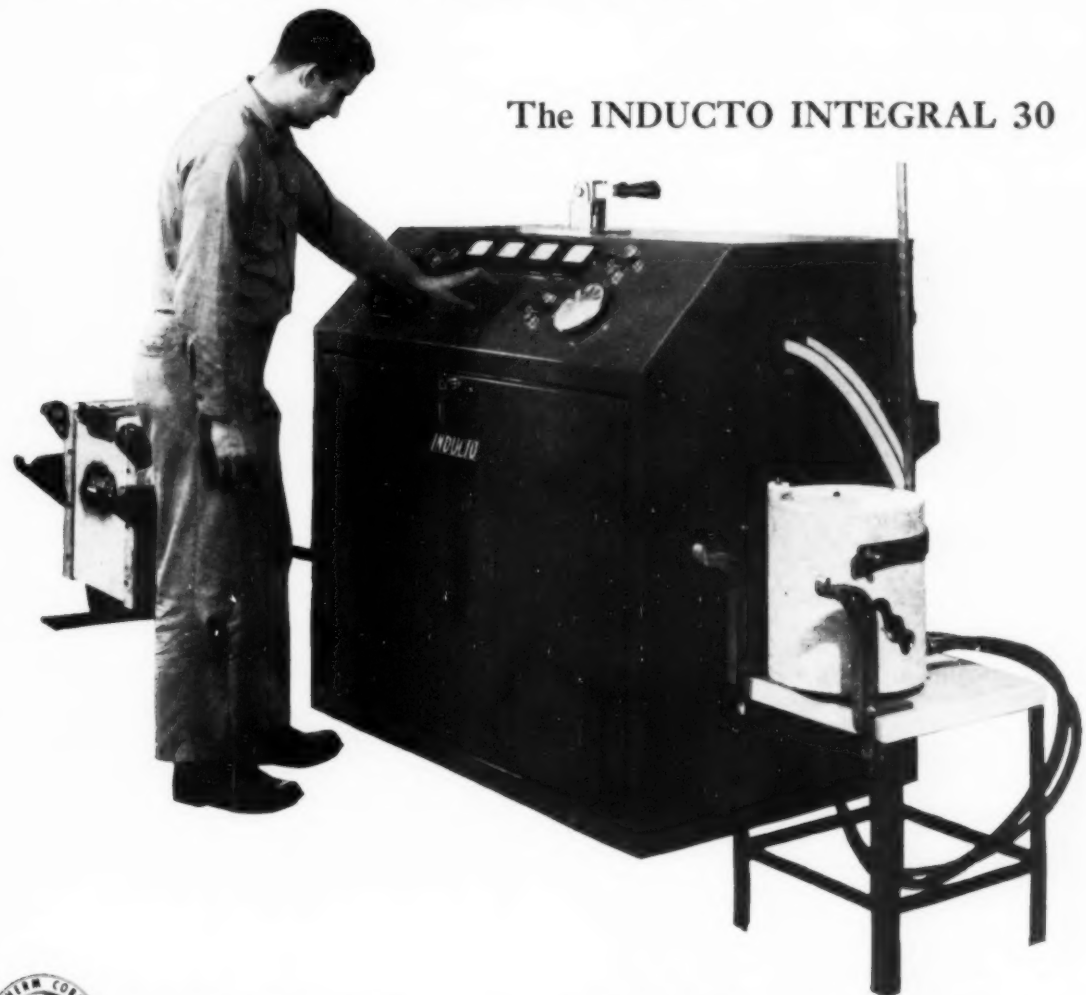
The Inducto Integral 30 is an efficient and economical melting unit that can be easily adapted to a variety of applications. Its console control panel contains all the equipment necessary to operate high-frequency induction furnaces and coils—a motor-generator set, capacitors, transformer and complete controls. Over 20 capacitor and 8 transformer steps, easily controlled from the front, provide the necessary flexibility to assure matching full power to all load conditions throughout the heating or melting cycles. The entire unit is designed for maximum dependability and ease of operation.

The Integral 30 is installed simply by connecting it to a 220 or 440 volt power supply, a cold water line and a drain. In fact, it is so compact and easy to install anywhere, the console can be made portable just by mounting it on casters.

Unique water-cooled leads simultaneously supply power and water to the furnaces. The same leads, with slight modifications, provide an economical power entry system for vacuum melting applications.

The Integral 30, with all the advantages of induction melting and Inducto engineering features, is truly the outstanding melting unit in the 5 to 100 pound range. No other equipment can offer you the same versatility, efficiency and economy. For complete details, write for Descriptive Bulletin 20-30, Inductotherm Corp., 412 Illinois Ave., Delanco, N. J.

The INDUCTO INTEGRAL 30



INDUCTOTHERM

INDUCTO ... the mark of modern melting

Circle 658 on Page 53

With new RIS-A-SLEEVS by Johns-Manville . . .

riser metal stays molten . . . precious minutes longer!

Now—for aluminum, brass and bronze casting—a new riser sleeve that contains heat more effectively than any product of its kind!

Here's the kind of riser sleeve you've long hoped would come along!

Developed by Johns-Manville research scientists, RIS-A-SLEEV® reduces heat transfer as effectively as an advanced industrial insulation. With heat more effectively contained within the sleeve, you have precious minutes longer to feed small remote areas, and greater assurance that the riser metal will be very last to freeze.

Because RIS-A-SLEEV insulates better, it lets you cut down still further on riser sizes . . . gives you closer control of solidification . . . results in sounder castings and fewer rejects.

And, of course, RIS-A-SLEEV will not contaminate sand. It's ideal, too, for blind risers. Available in complete range of sizes . . . at surprisingly little cost. We invite you to test RIS-A-SLEEV. We'll be pleased to send you samples along with complete information. Write today to Johns-Manville, Box 14, New York 16, New York.

JOHNS-MANVILLE

JOHNS MANVILLE JM PRODUCTS

CHARLES R. MUENGER
. . . joins Dollin Corp.

JAMES M. PLANTEN
. . . joins Foundry Design Co.

ARTHUR E. MURTON

GEORGE E. KOPETZ
appointments announced by Blaw-Knox Co.

of Delaware, Newark, Del. Dr. Schumann, who was at Massachusetts Institute of Technology until he joined Purdue five years ago, has been chairman of the department of metallurgical engineering.

Charles R. Muenger has been appointed production plant manager, Dollin Corp., Irvington, N. J. He had been with Schultz Die Casting Co., Toledo, Ohio, for 22 years.

Dr. John W. Jordan, technical director, Baroid Div., National Lead Co., Houston, was awarded an honorary doctor of science degree from Marietta College, Marietta, Ohio recently. A graduate of Marietta College, he received his Ph.D. in chemistry from Columbia University.

Robert J. Ehrhart, for the last two years with Buick Motor Div., General Motors Corp., Flint, Mich., has been named sales engineer, Simplicity Engineering Co., Durand, Mich.

James M. Planten, formerly a vice president, Lester B. Knight & Associates, Chicago, has joined Foundry Design Co., affiliate of Sorbo-Mat Process Engineers, St. Louis, as vice president and associate.

Lewis F. Osborne, recently with Cincinnati Milling Machine Co., Cincinnati, has joined Bunting Brass & Bronze Co., Toledo, Ohio, as representative in southwestern Ohio and Indiana. **Joseph E. Mila** has been assigned to the Detroit territory. Mr. Mila has been with General Motors Corp.'s New Departure Div.

H. M. Patton has been named works manager, American Hoist & Derrick Co., in charge of operation of the company's St. Paul plants. He will continue as president of Valley Iron Works there which was acquired by American Hoist last year. Mr. Patton joined the company in 1942 as foundry superintendent and later became foundry division manager.

George E. Kopetz, vice president-production, has been named vice president and general manager of the fabricating, engineering and construction group, Blaw-Knox Co., Pittsburgh. **Arthur E. Murton,** formerly roll sales vice president, has been appointed vice president-general manager of the foundry and mill machinery group. **H. G. Coffey** heads the company's third operating group as vice president-general manager of the Aetna-Standard Div.

Herbert C. Philander, formerly with Illinois Clay Products Co., Joliet, Ill., recently joined North American Refractories Co., Cleveland, as sales promotion manager.

Fred C. Nilson and **William J. MacNeill** have been named special service associates, Westover Corp., Milwaukee. Mr. Nilson spent the last ten of 40 years in plant layout and material handling activities with Bucyrus-Erie Co., Milwaukee, as plant consultant. Mr. MacNeill,

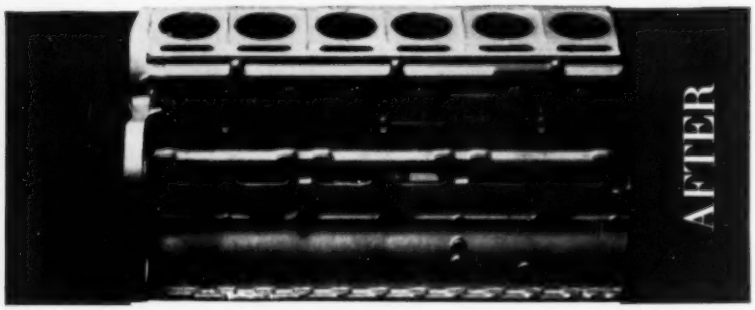
ROBERT J. EHRHART
. . . Simplicity sales engineer

H. M. PATTON
. . . becomes works manager

FRED C. NILSON

WILLIAM J. MacNEILL
Westover associates

GOLDEN FOUNDRY CO., INC. SAVES $5,000 ANNUALLY WITH WHEELABRATOR STEEL SHOT®



Wheelabrator Steel Shot saved Golden Foundry Co., Inc., Columbus, Indiana, $4,957.00 in their cleaning costs in one year.

How was it done? By changing from a malleable type abrasive to Wheelabrator Steel Shot.

Tests made over a period of a full year showed conclusively that Wheelabrator Steel Shot reduced abrasive consumption from 18 lbs. to 10 lbs. per wheel-hour over a malleable type abrasive. This 45% reduction in abrasive used brought actual savings of 28.4¢ per wheel-hour of operation.

More than 1,200 firms now have standardized on Wheelabrator Steel Shot, and are making similar impressive savings. Consistently harder, with greater resistance to breakdown, Wheelabrator Steel Shot lasts longer in use, cleans better, and reduces total cleaning costs. Your Wheelabrator Abrasive Engineer will help you achieve similar savings.

Send for complete information on how Wheelabrator Steel Shot can solve your cleaning problems.

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WHEELABRATOR
CORPORATION

505 South Byrkit Street Mishawaka, Indiana

Canadian Division: Box 490, Scarborough, Ontario

World's Largest Manufacturer of Quality Steel Abrasives

since 1952 vice president-operations, Badger Malleable & Mfg. Co., South Milwaukee, Wis., was in malleable, gray iron nonferrous operations and management over 40 years.

A. Donald Moll has been appointed manager of technical services and sales of high alloy and stainless steel castings, Minneapolis Electric Steel Castings Co., Minneapolis, in addition to his duties as assistant sales manager.

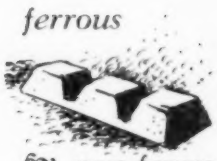
A. DONALD MOLL
. . . technical services mgr.

Edwin G. Chapman, formerly chief engineer, Misco Precision Casting Co., Whitehall, Mich., has joined the Hitchiner Mfg. Co., Milford, N. H., as sales manager.

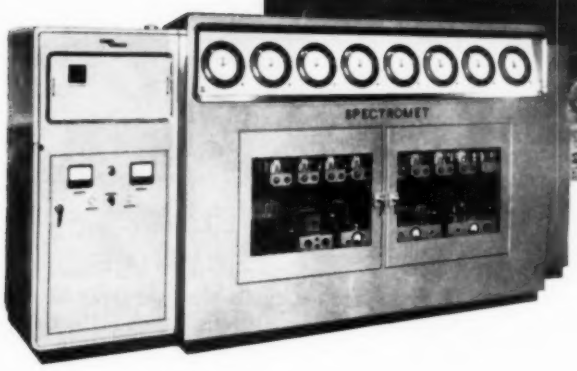
EDWIN G. CHAPMAN
. . . joins Hitchiner Mfg. Co.

D. Bedell Baxter has been named assistant to the vice president-service engineering, Basic Inc., with headquarters in the Cleveland home office. **David E. Holmgren** has been appointed sales development engineer there. **Thomas P. Stanton** will be in charge of the eastern sales

ferrous



& non ferrous



SAVINGS

in the melt shop by quick analysis with the

NEW SPECTROMET®

CHEMICAL COMPOSITION IN MINUTES
NO LABORATORY REQUIRED

The Baird-Atomic SPECTROMET allows high precision analysis of alloying and minor elements to be made quickly and easily. Results are reported to the melt shop in minutes permitting corrections to be made prior to pouring. The expanded SPECTROMET is specially designed for rugged, practical use . . . to be operated by non-technical personnel.

SAVE MONEY, SAVE TIME, ELIMINATE WASTE

- Eliminate "off analysis" heats.
- Shorter furnace holding time permits more heats per month, minimum loss of alloy elements, longer furnace life, lower fuel costs.
- Conserve expensive alloying elements by confidently aiming at low side of the specification. Detect harmful tramp elements.
- Install close to the melt shop without need for special laboratory.
- Reduce expenses by saving manpower, supplies, and space.

Only the SPECTROMET offers all these features:

- Results presented on indicator dials directly in percent concentration.
- The *Automatic Optical Servo Monitor* to provide continuous compensation for variation in temperature and atmospheric pressure, vibration and shock.
- Parallel interchangeable read-out channels to increase reliability, facilitate maintenance.
- Logarithmic read-out system to permit wide concentration range on one scale, element standardization with one sample, interchangeable channels without calibration.

Baird Atomic

Baird-Atomic, Inc.

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CAMBRIDGE 38, MASS.

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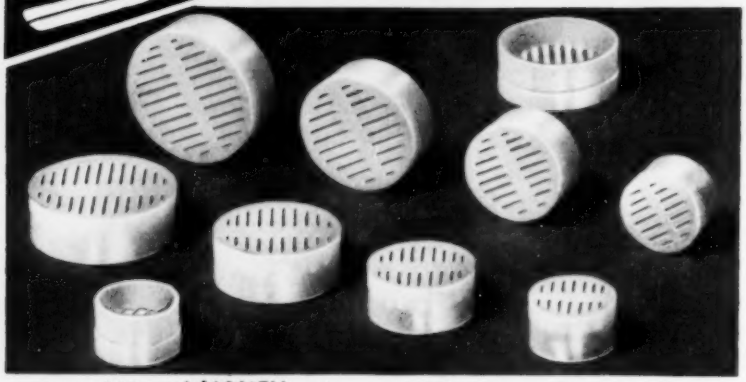
Circle 661 on Page 53

NEW NON-CLOGGING NYLON CORE VENTS
WITH EXCLUSIVE LOCK IN SLOT CONTROL
(ALL STANDARD SIZES FROM 3/16" TO 1 1/2")



SAVE TIME and MONEY with one standard Non-Clogging Vent for All Blowplates and Core Boxes.

- Out lasts metal vents 3 to 1.
- Acid, Oil and Steam resistant.
- Easily and quickly contoured to shape of box.

Samples on request. . . Phone, Wire, Write Today!

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Circle 715 on Page 53

NOMAD CONVEYOR SYSTEMS

STOP BOTTLENECKS IN YOUR CLEANING ROOM!

INCREASE PRODUCTION and CONSERVE MANPOWER

Castings are routed through the cleaning room in proper work sequence on track conveyors. Not only is all work kept at a normal working height, but casting segregation is maintained throughout.

For **complete mobility**—install a Nomad Conveyor System!

Write Today for Catalog showing other types of conveyors and equipment.

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NOMAD EQUIPMENT

office recently opened in Philadelphia. **George J. Peer** has been named midwestern district sales manager in Hammond, Ind., **Ralph E. Forsman** has been transferred from St. Louis to Hammond, and **Charles J. Tyson** takes over the St. Louis office.

James E. Martin has been named Cleveland district manager, Pangborn Corp., Hagerstown, Md., succeeding **Robert E. Donnelly**, who

JAMES E. MARTIN
. . . Pangborn district mgr.

retired after 30 years of service. Mr. Martin, with the company for 14 years, served as sales engineer in Philadelphia and since 1949 has been in Cleveland where he was assistant district manager.

Richard A. Brackett, executive vice president, the Spencer Turbine Co., Hartford, Conn., and vice president of the Foundry Equipment Manufacturers Association, has been named to the National Defense Executive Reserve of the Business and Defense Services Administration, Department of Commerce. **Leslie L. Andrus**, vice president, Wheelabrator Corp., Mishawaka, Ind., has also been so designated.

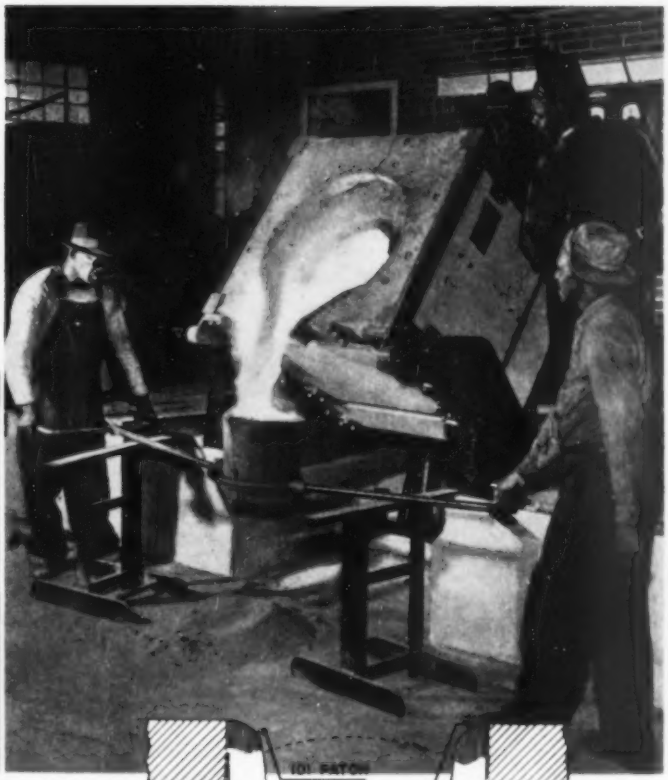
John C. Puckett has been named customer service supervisor, Hamilton Foundry & Machine Co., Hamilton, Ohio, replacing **James M. Hall**, who has resigned. Mr. Puckett was formerly with Aeronca Mfg. Corp. and Pollack Paper Co., Middletown, Ohio.

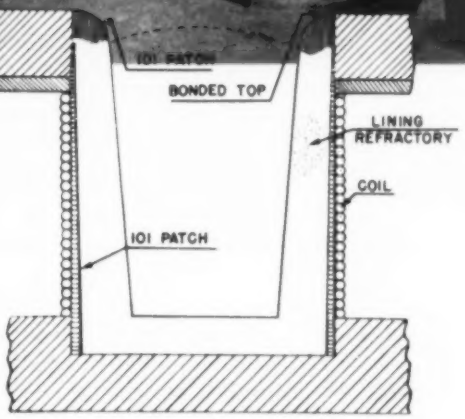
Keith D. Millis, assistant to the manager, Development and Research Div., International Nickel Co., New York, recently received

Circle 662 on Page 53

USE

TASIL NO. 101 PATCH





for high frequency induction furnaces

TASIL (Taylor Sillimanite) No. 101 Patch is widely used by operators of high frequency induction furnaces for coating of the inner surface of the water-cooled, primary coil. When air dried, this coating will:

1. **Protect the coil when the crucible is being rammed in place.**
2. **Protect the coil from damage in the event of a leakage of metal through the lining proper.**

Properties which qualify TASIL No. 101 Patch for this service are: *high di-electric strength . . . smooth working properties . . . softening point above 3200° F. . . . negligible shrinkage or expansion . . . can be used with either an acid or basic lining.*

There is a complete line of TASIL (mullite), TAYCOR (corundum-base) and TAYLOR ZIRCON Ramming Mixes and Cements for every metallurgical need. Write for recommendations to cover your melting requirements.

The **CHAS. TAYLOR SONS Co.**
A SUBSIDIARY OF NATIONAL LEAD COMPANY
REG. U. S. PAT. OFF.
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Exclusive Agents in Canada:
REFRACTORIES ENGINEERING AND SUPPLIES, LTD.
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Circle 663 on Page 53

SAVE

WITH

Acme

MELTING POTS

INGOT MOLDS

Designed by
FOUNDRYMEN...
for FOUNDRYMEN

You'll find it pays to standardize on Acme melting pots and ingot molds. They reduce down time and replacement costs because they're cast from a special iron formula that combines strength with high temperature resistance. They improve quality and reduce rejects, too, because they're designed for even heat distribution without hot spots. If you melt any non-ferrous metals, take advantage of our more than 30 years' experience in this field. It's your assurance of consistent high quality in Acme melting pots and ingot molds . . . designed *by* foundrymen, *for* foundrymen.

Quick delivery anywhere in the United States. Write for size list showing 40 standard sizes.

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the Annual Achievement Award in Metallurgy of the New York Chapter of the American Society for Metals for contributions to industry and the metallurgical sciences and for activities and projects pursued in interests of the society.

Charles F. Witters, for 20 years national manager of core oil sales, Cities Service Oil Co., New York, recently joined Delta Oil Products Corp., Milwaukee, as manager of

CHARLES F. WITTERS
. . . joins Delta Oil Products

distributor sales. **Nard V. Stapf** has been named technical sales representative for Delta in Ohio and Kentucky. **Robert W. Gall** will handle sales in Indiana, eastern Illinois and southwestern Michigan.

C. Fabian McGraw has been appointed manager of the zinc metal sales department, Eagle-Picher Co., Cincinnati, succeeding the late Cleo J. Johnson. Mr. McGraw has been national accounts sales manager of the company's storm enclosure department since 1954. **Earl Cannon** has been named assistant to Mr. McGraw.

W. T. Cole, former vice president, Canton Malleable Iron Co., Canton, Ohio, has been named vice president, H-P Products Inc., Louisville, Ohio, maker of central built-in vacuum systems.

August Sunnen, since 1954 vice president, Ramsden Mfg. Ltd., London, Ont., Canada, has been named general manager, Sunnen Products Ltd., Chatham, Ont., succeeding his father, the late Gus Sunnen. August Sunnen was with the company's St. Louis operation for eight

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PQ PLANTS: ANDERSON, IND.; BALTIMORE, MD.; BUFFALO, N.Y.; CHESTER, PA.; JEFFERSONVILLE, IND.; KANSAS CITY, KANSAS; RAHWAY, N.J.; ST. LOUIS, MO.; UTICA, ILL.

Circle 665 on Page 53

years and has been a director of the American company and Canadian firm since 1947.

Wayne Smith has joined Detroit Mold Engineering, Detroit, as representative in western New York,

WAYNE SMITH
. . . Detroit Mold Eng. sales

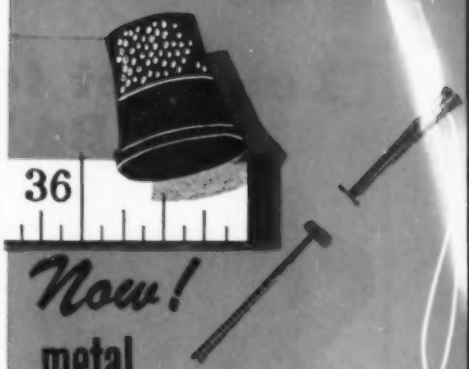
western Pennsylvania, and Ontario, Canada. He has been with Erie Resistor Corp., Erie, Pa., as mold buyer and estimator.

Paul T. Eubanks has joined Conco Engineering Works, Mendota, Ill., as sales manager for the Chicago district. **S. J. Woodworth**

PAUL T. EUBANKS
. . . joins Conco Engineering

has been named district sales manager in New England and the Middle Atlantic states with headquarters in New York.

Donald F. Brookland has been elected vice president for alloys, Tennessee Products & Chemical Corp., subsidiary of Merritt-Chapman & Scott Corp., Nashville, Tenn. Recently Mr. Brookland was vice president-operations, Keokuk Electro



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Circle 666 on Page 53

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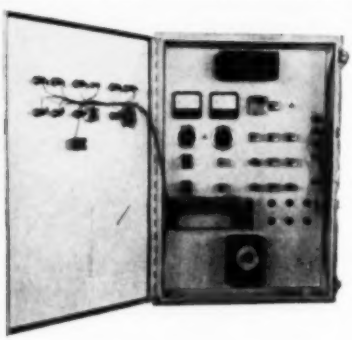
Circle 667 on Page 53 A9-4512

HARTLEY HYGRO-GUIDE SERIES XII $2995.00 COMPLETE



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Single probe in mixer controls water as indicated by temperature and moisture of return sand. Can't double-batch! Other advantages include: Accessible and instant moisture adjustment . . . plug-in mounted relays . . . finger-tip mulling cycle regulator . . . cam operated timer with 12 stations.

Accurate—foolproof—easy to install and maintain—the Hartley Hygro-Guide Series XII comes complete in NEMA type 12, 30" x 42" x 8" cabinet, which may be located any distance from mixer.

Full particulars sent promptly on request.

HARTLEY Controls CORPORATION

Neenah • Wisconsin

Metals, Keokuk, Iowa. He succeeds **Marcus Evans**, who has been transferred to an administrative post in Tennessee Products' headquarters offices in Nashville.

Robert D. Bradford and **Edward McL. Tittmann** have been elected executive vice presidents, American Smelting & Refining Co., New York. **Charles F. Barber** has been elected a director and a vice president, and **Forrest G. Hamrick**, vice president.

Robert H. Hoagland, for the last five years vice president, Aerovox Corp., New Bedford, Mass., has

ROBERT H. HOAGLAND
. . . Claud S. Gordon v. p.

been elected vice president-general manager, Claud S. Gordon Co., Chicago.

George F. Paulus, for four years with Congoleum-Nairn Co., West Orange, N. J., has joined the research and development staff, Acheson Colloids Co., Port Huron, Mich., as product development chemist.

Robert F. Sutherland, formerly with A. P. Green Fire Brick Co., Mexico, Mo., has joined the Refractories Div., H. K. Porter Co., Pittsburgh, as representative in New York.

Lowell H. McCreery, formerly supervisor, engineering structures, Chance-Vought Aircraft Inc., Dallas, has joined Tempco Aircraft Corp., Garland, Tex., as technical specialist in advanced studies.

K. J. Kettner has been appointed regional sales manager in the northern Ohio and Michigan district, Ramtite Co. Div. of S. Obermayer

Circle 668 on Page 53

Co., Chicago. **William J. Finn** has been transferred to Detroit, **Ron E. Opre** to the Cleveland area, and **Charles E. Miles** to Youngstown, Ohio.

Hugh A. Unum has been named field engineer on roving assignment, Steel City Testing Machines Inc., Detroit, Mich. For four years he has been chief of the Electro-Mechanical Standards Laboratory at Gentile Air Force Base.

John R. Crossgrove has been appointed specialist - marketing research, foundry department, General Electric Co., Schenectady, N. Y. He joined the company in 1957.

JOHN R. CROSSGROVE
. . . GE market research

John J. Chalmers has been named manager of the New York sales and service branch of Yale Materials Handling Div., Yale & Towne Mfg. Co., Philadelphia. He has been president, Schenectady Material Handling Co., Yale sales-service representative in Schenectady, N. Y.

W. L. Nopper, formerly Philadelphia district manager, Roots-Connersville Blower Div., Dresser Industries Inc., Connersville, Ind., has been named district manager of the New York sales office.

E. C. Jeter, plant manager, Ford Cleveland Foundry, Berea, Ohio, has been named a director of the Cleveland Chamber of Commerce for a three-year term.

Jacob J. Walter has been appointed a refractories engineer, Norton Co., Worcester, Mass., with headquarters in the Philadelphia office.

The "H-W" Catalog of

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The Famous "BUYER'S GUIDE" Is Yours for the Asking

It's not a price list, but rather a complete catalog of the materials and supplies used by steel plants and foundries.

A few of the many items listed in the Buyer's Guide include . . .

Analyses of the many types of Coke and Pig Irons which are essential in the operation of steel plants and foundries; discussion of Silvery iron and its uses; Sands and Clay; Ferrophosphorus; Speigeleisen; Fluxes; and Shot and Grit, together with other useful information.

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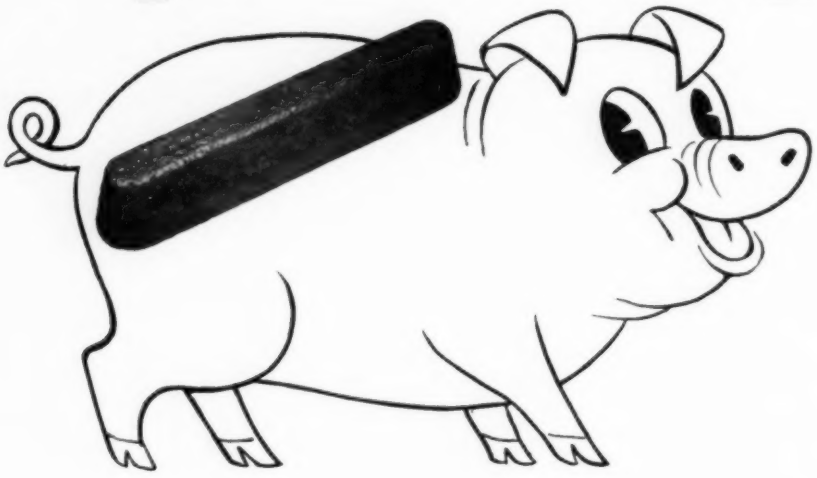
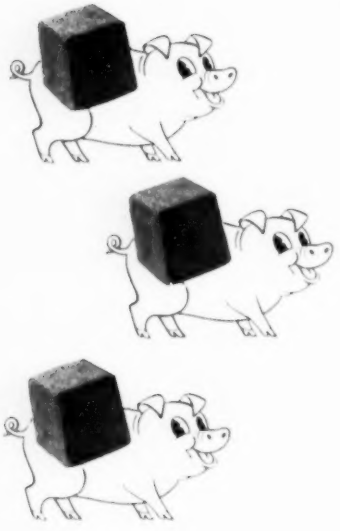
Circle 669 on Page 53

A treat for your heats from Iowa

Alloymet Pigs



. . . and new 10 pound piglets now available in a new breed of Ni-Cr-Mo Cupola Additive



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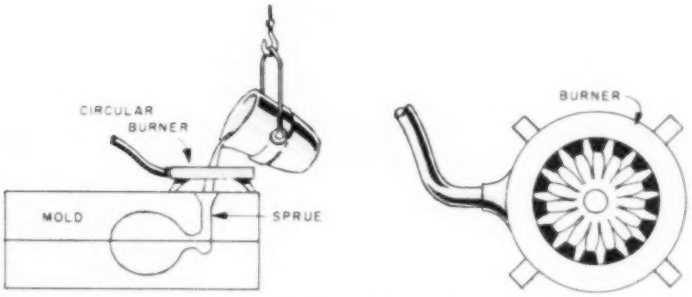
Trouble Shooting

By C. W. AMMEN



To prevent gassing during pouring of high-silver castings, pour metal into the sprue through a circular gas burner with a reducing flame

High-Silver Castings

Dear Charlie:

We are in the process of making some castings containing 90 per cent silver and 10 per cent copper, and 95 per cent silver and 5 per cent copper. As you know, these alloys are quite expensive and are ticklish to handle since they act very much like pure copper castings, spitting and gassing very badly. Sprue tops puff up like mushrooms. The alloys are quite sluggish, with or without addition of 15 per cent phosphor copper.

We also have some QQ-M-50 ClC4 coming up for the same customer containing 86.75 per cent Ag, 8.8 per cent Mn, and 4.45 per cent Al. We have not been able to digest the first two alloys, much less the third. We have been told to use saltpeter to liven things up. Also what cover flux should we use?

Sincerely,
Sam

Dear Sam:

Alloys high in silver are not the easiest to cast, owing to their tendency to pick up oxygen. A bit of practice and a few little tricks are required to make sound castings. The molding procedure is the same basically as with high-copper work —sand not too wet, proper venting, pouring, gating, etc.

Every time someone asks about flux the question arises as to what is desired—to oxidize, deoxidize, or just provide a protective cover. Saltpeter is an oxidizing agent and hardly is desirable with the Ag-Cu alloys since both elements oxidize easily. Deoxidizers for those alloys include lithium, phosphor-copper, calcium boride, sodium-zinc and cadmium, and the choice will depend largely on the limitations of the specifications on allowable impurities.

With reference to deoxidizers it might be pointed out that the use of cadmium was held a trade secret for many years, and the amount generally employed is about 0.5 per cent. Cadmium has a boiling point of 1432° F, and hence should not be added too far ahead of the time of pulling the pot from the fire, else its effect will be nullified by evaporation. On the other hand, because it does vaporize, little if any is left in the alloy.

In the case of phosphorus, the usual addition is 0.05 per cent P added as 15 per cent phosphor-copper, or about 0.3 oz of Cu-P per 100 oz of the silver alloy. This amount should not be exceeded when nickel is present, as mentioned later, since any excess P will form a hard, brittle nickel phosphide constituent.

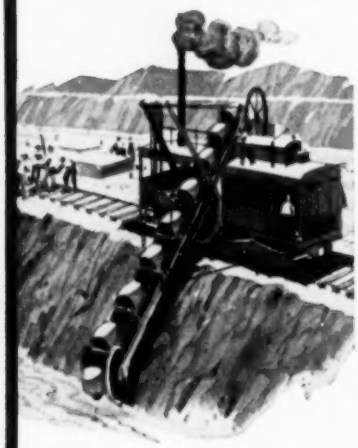
Covers used in melting silver alloys are sugar, charcoal, soda ash, argol, potassium carbonate, etc. Charcoal and sugar are used most often. Straight covers such as borax, fluorspar, glass, etc. can be used to prevent gas absorption during melting.

If you have a grand mess to melt and it's dirty, make up a good cleaning flux composed by weight of borax (granular) 1 part, sharp sand (fine) 1 part, powdered glass ¼ part, potassium ferrocyanide (powdered) 4 parts, and sodium carbonate—2 parts.

Run the metal down under a light, dry, charcoal cover and when good and hot (50° F above the melting point) work in about ½ teaspoon per lb of metal of the cleaner. Then skim, cover again with dry charcoal and bring up to pouring temperature. Pull the pot and skim. Now add a pinch of bismuth and watch what happens. The bismuth will make the silver as liquid as water. As a secondary precaution to prevent gassing during the pouring operation, pour the metal into the sprue through a circular gas burner set directly around and above the sprue. Pour through the flame. The flame must be adjusted so that it is reducing; that is, it burns luminous or yellow. Odd as this sounds, the results are most gratifying.

Another thing that increases the castability of silver alloys by a wide margin is the addition of nickel. About 0.125 per cent nickel is all it takes—added in the form of Ni-Cu shot. The addition of 2 per cent by weight of boric acid to the temper water for the sand helps secure

since the digging of the Panama Canal (1904)



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Circle 671 on Page 53

a nicer casting. Avoid the use of anything that would cause a sulfur pickup.

If, when the cover is skimmed off and the bismuth is added, the melt does not look clean and shiny like a mirror, then and only then use something like saltpeter with another touch of bismuth. Lithium is also used to some extent. There are many very good fluxes and deoxidizers on the market. You will find the third alloy can be deoxidized readily with a few ounces of metallic magnesium plunged to the bottom. However, do not omit the use of bismuth; its action is remarkable when silver is present.

Sincerely,
Charlie

ASM Institute Offers Home Study Courses on Castings

A home study course covering all phases of steel casting has been released by Metals Engineering Institute, a division of American Society for Metals. Called "Steel Foundry Practice," it was edited for the institute by C. W. Briggs, technical and research director, Steel Founders' Society of America and covers the techniques and underlying metallurgy connected with the subject.

Another course, entitled "Copper, Brass and Bronze," is designed for technical, production, sales, and management personnel within the industry. Author is Dr. Owen W. Ellis, consultant, formerly director of the Department of Engineering and Metallurgy, Ontario Research Foundation. Special emphasis is placed on casting techniques.

Detailed information on the courses may be secured from Metals Engineering Institute, Dept. FS-1, 7301 Euclid Ave., Cleveland 3. The Institute's new catalog of 17 metal courses also is available.

Lists Material Handling Films

"Industrial Material Handling Films" is the title of a new 16-page booklet which reviews films available from member companies of the Material Handling Institute, One Gateway Center, Pittsburgh 22. It describes briefly 63 industrial films and gives ordering information.

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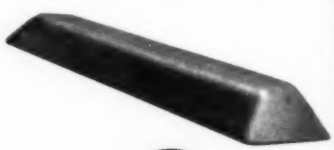

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Circle 672 on Page 53

BOOKS
FOR FOUNDRYMEN

Our Book Department carries a wide variety of books of particular interest to foundrymen. Here are some titles presently available. If you are seeking a title not listed, write us—we'll be glad to get it for you.

PRINCIPLES OF METAL CASTING

By Richard Heine and Philip Rosenthal. Covers every step of standard foundry processes . . . explains what equipment is used for each phase, when and how it is used . . . and describes proven procedures that make for greater economy in metal casting. Crammed with photographs and illustrations. —$7.50

STEEL FOUNDRY PRACTICE

By John Howe Hall. A comprehensive sourcebook covering all phases of modern steel foundry practice. Contains practical information on almost every production problem steel foundrymen encounter. —$12.00

A NEW COST MANUAL FOR THE GRAY IRON CASTINGS INDUSTRY (No. 2)

Here in 120 carefully planned pages is a complete Cost Account System for both a small foundry with minimum accounting facilities and a large foundry capable of detailed cost determinations for accuracy and completeness.
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Every modern thinking product designer needs this handbook. Contains reliable working data for utilizing the properties of cast metals to the greatest engineering advantages—unbiased and substantiated information on new, reliable developments in cast materials—practical, up-to-date facts on HOW to get the most out of castings designs. —$10.00

BRASS AND BRONZE FOUNDRY PRACTICE

By Harry M. St. John

Now brass founders have available a comprehensive modern treatment of all aspects of brass foundry theory and practice in one source.
It covers the entire range of brass foundry operations and its 23 chapters discuss alloys, technical and operating procedure, quality control, testing, brass foundry economics, cost control, casting design, patternmaking, foundry layout, and salvage of waste material. The text is supplemented by 85 illustrations which clarify and enlarge on the subject matter.

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By A. J. Murphy. Covers general principles unifying foundry techniques of all industrial nonferrous metals in relation to metals in the liquid state, to the process of solidification and to the factors influencing properties of casting. 497 pages. —$12.50

METALLURGY OF STEEL CASTINGS

By Charles W. Briggs. A comprehensive work. Provides complete information on methods of technical and industrial control in production of steel castings and describes every manufacturing process used. —$11.00

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Over 100 leading authorities on foundry problems collaborated with the author, Harry W. Dietert, to pool their knowledge in making this the type of book that is of maximum benefit to the foundry field. —$10.00

METALLURGY FOR ENGINEERS

By J. Wulff, H. F. Taylor and A. J. Shaler. This book is written from the metallurgical rather than the shop point of view and aims to give the reader "an adequate understanding of metals so that he may intelligently select and use them." 624 pages, 290 illus. —$7.25

BASIC COST PRINCIPLES FOR NONFERROUS FOUNDRIES

An up-to-the-minute guide for costing in both small and large foundries. Prepared by practical foundrymen, book is based on 10 years' research and experience under Government pricing regulations. —$5.00

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- ☐ Brass and Bronze Foundry Practice
- ☐ Cupola and Its Operation
- ☐ Cast Metals Handbook
- ☐ New Cost Manual for the Gray Iron Castings Industry (No. 2)
- ☐ Nonferrous Foundry Metallurgy
- ☐ Metallurgy of Steel Castings
- ☐ Steel Foundry Practice
- ☐ Foundry Core Practice
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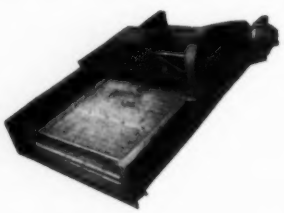

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Obituary

Sheldon V. Wood, board chairman, Minneapolis Electric Steel Castings Co., Minneapolis, a former president of the American Foundrymen's Society, died May 31. A native of Iowa he was graduated from University of Minnesota. He joined Minneapolis Electric Steel in 1913 as manager. He was active in the organization of the Twin City Chapter of the AFS and served as one of its directors, director of the national organization, and president of AFS in 1946-47.

George J. Leroux, 77, long an executive of National Malleable & Steel Castings Co., Cleveland, died May 28. He was with the company 54 years when he retired in 1952 and had been assistant plant manager in charge of industrial relations and personnel for 25 years. Mr. Leroux joined the old Toledo, Ohio, plant while attending St. John's College. He became foundry foreman there and in 1918 was made employment manager. The following year he was transferred to the Cleveland Works.

George E. Dalbey, 72, former metallurgist, U. S. Navy Yard, Mare Island, Calif., died Mar. 5 in Lake Wales, Fla., where he had lived since his retirement in 1953. He was a former director of the Northern California Chapter of the American Foundrymen's Society and also of the national organization.

J. M. Gallaher, 67, secretary-treasurer, Clearfield Machine Co., Clearfield, Pa., died May 14. He had been with the company 40 years.

Kingston F. Swallow, 49, board chairman, Motor Castings Co., Milwaukee, died May 15. His father was president of the company prior to his death in 1939.

Raymond E. Relph, a director and works manager, Hanford Foundry Co., San Bernardino, Calif., died June 6. Mr. Relph was active in West Coast activities of the Steel Founders' Society of

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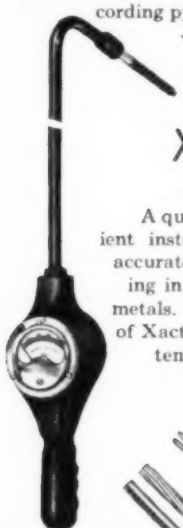

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Circle 675 on Page 53

America and was vice chairman of California Division 8, T & O Group.

Charles F. Miller, 80, former president, Fairmount Foundry Co., Woonsocket, R. I., died Mar. 11. With the company since about 1935, he retired as president last year but continued as a director. Mr. Miller was president of the former New England Foundrymen's Association in 1928-29.

Cleo J. Johnson, manager, zinc metal sales department, the Eagle-Picher Co., Cincinnati, died May 22, in Afton, Okla. With the company 28 years, he had lived in Miami, Fla., until last year when he was transferred to Cincinnati.

John A. Lamont, 86, formerly manager of the patent department and assistant mechanical engineer, American Steel Foundries, Chicago, died May 10. He retired in 1940 after 30 years with the company.

Henry N. Schramm, president, Schramm Inc., West Chester, Pa., died May 12. He had been active in the company since 1900 and president since 1925.

James S. Stringfellow, 64, assistant foundry superintendent, Draper Corp., Hopedale, Mass., died May 27. He had been with the company since 1922.

Joseph C. Meyer, sales representative, Snyder Foundry Supply Co., Pasadena, Calif., died Apr. 19.

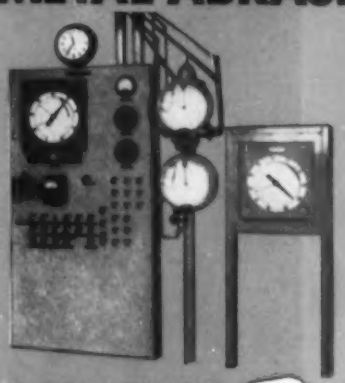
Earl H. Owen, 72, former secretary, Owen Pattern Foundry & Mfg. Co., Norfolk, Va., died May 6. He retired in 1957.

Dow Reorganizes Sales Groups

Dow Chemical Co. has reorganized its magnesium sales organization into two groups. A Metal Sales Dept., headed by William S. Loose, will specialize in sale of primary metal, alloy ingot, and cast anodes. A Magnesium Products Sales Dept., with Donald H. Gilmore as manager, will concentrate on sales of sheet, extrusions, sand and die castings, and fabricated products.

Now!

METAL ABRASIV



CUSTOM MADE for YOU

The newest development in manufacture of metal abrasive is custom-made "Malleabrasive"—job-lot-made to meet individual cleaning conditions.

By means of new, highly specialized processing techniques and equipment used only by us, we can make the type of "Malleabrasive" shot or grit that will do your particular job best, at lowest cost to you.

Why put up with general purpose abrasives when you can have "Malleabrasive" tailor-made for you? We'll welcome the chance to tell you how you can benefit. Write us.

Circle 676 on Page 53

THE GLOBE STEEL ABRASIVE CO.

Mansfield, Ohio

Sold by Pangborn Corp., Hagerstown, Md., and by many leading distributors of foundry supplies from coast to coast.

MALLEABRASIVE

In the old blacksmith shop at Hopewell Village, horses and mules were shod, woodchopper's axes steeled, and metal posts and fixtures for wagons and equipment made

Residence of Mark Bird and later ironmasters contains 14 rooms and two baths with open fireplaces

Restored Village Depicts

Early Ironmaking Center

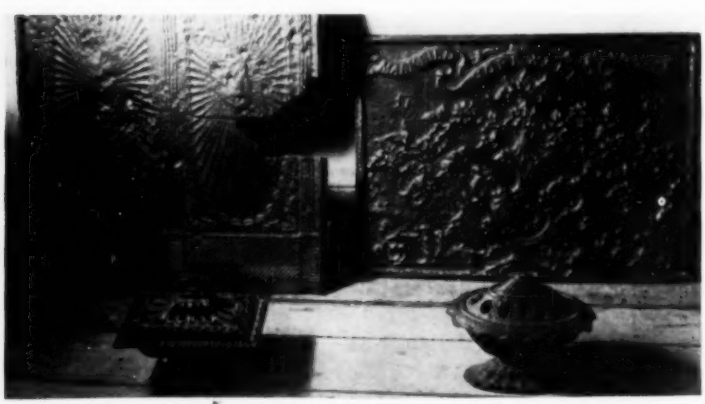
By BURCH TRAINER

● ON A WINDING country road 5 miles southeast of Birdsboro, Pa., near the Pennsylvania Turnpike, Hopewell Village stands. Once a flourishing ironmaking center, it was a community where all activity suddenly stopped. People moved away, and Hopewell became a deserted and almost forgotten village.

The first attempt at ironmaking in this country was made at Falling Creek, Va., in 1619, but that community was wiped out by unsympathetic Indians three years later. Saugus, Mass., was the site of the earliest successful works, and the industry soon spread down into Pennsylvania, New Jersey, and Maryland.

It was in Pennsylvania, however, that colonial iron manufacture achieved its most striking expansion. Scattered over the southern portion of the state—especially in the Schuylkill Valley, along the beautiful blue Juniata, and across the wooded Alleghenies—the ruins of the old furnaces still may be found.

Hopewell Furnace, one of the largest of the charcoal burning, cold blast furnaces of the 18th and 19th centuries, still stands at the village. It rises 32 ft high, is 22 ft square at the base, and had an average an-



◀ Hopewell stove plate cast in 1772

chips or briquettes

—it's still world famous

HOEGANAES MELTING STOCK

GRADE "A"
available in briquette form—write for price & data folder No. 119

GRADE "E"
available in briquette or chip form—write for price & data folder No. 120

The very first on the American market. These Ancor Sponge Iron Briquettes or Chips are virgin, soft iron of extreme purity, free from tramp elements and dissolved gases. They're time-tested and field-tested as a raw material for quality steel production, primarily in acid open hearths, induction furnaces and basic electric arc furnaces.

Hoeganaes Ancor Sponge Iron is a metallic product reduced from iron ore at such low temperature that melting of the iron or the gangue constituents has not taken place. *They have exceedingly uniform analysis from shipment to shipment.*

This is of importance too . . . the following elements are non-existent or only present in trace amounts . . . Nickel, Molybdenum, Cobalt, Zinc, Hydrogen, Nitrogen, Chromium and Tin. Ancor Sponge Iron has a very high degree of reduction—96%. It performs at least as well as a low-carbon, high-grade ingot iron.

If you're interested in *regularity of your melting operation* and *greater uniformity of your steel analysis*, be sure to write for the fact-filled literature. Better still, ask for a Hoeganaes Engineering Specialist to call and give all the facts first hand. He's at your service.

HSDC

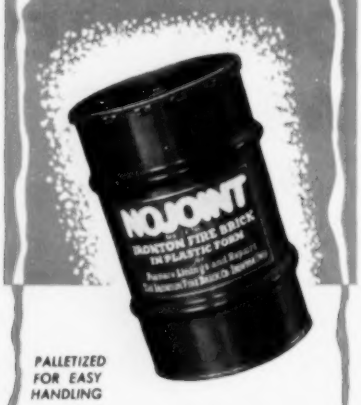
HOEGANAES

HOEGANAES SPONGE IRON CORPORATION

RIVERTON, NEW JERSEY

SALES REPRESENTATIVES IN PRINCIPAL CITIES: Birmingham, Chicago, Cincinnati, Cleveland (Fostoria), Edmonton (Alberta, Canada), Los Angeles, Minneapolis, New England (Elmira, N.Y.), Philadelphia (Riverton, N. J.), Pittsburgh, San Francisco, St. Louis

YOU SAVE $$$ because this plastic STAYS MOIST 2 YEARS



PALLETIZED FOR EASY HANDLING

IT'S ALWAYS SAFE to save money by ordering **Ironton NOJOINT** in 550 pound drums because this plastic refractory stays moist and usable for **TWO YEARS!**

SAVE THREE WAYS WITH NOJOINT IN DRUMS

1. No loss from drying out. Tight lid keeps **NOJOINT** always ready for day-to-day jobs.
2. Skip the warehouse charges, purchase larger quantities direct from Ironton.
3. Freight cost per ton is lower on single large shipment than on small re-orders.

WHEREVER HOT METAL RUNS in your foundry, use **NOJOINT.** Best for lining ladles, cupola spouts, tapholes, slag holes... and for patching the cupola well.

OTHER CONVENIENT PACKAGES OF NOJOINT

- 100 lb. cartons MOIST in slices 2" thick.
- 100 lb. bags, DRY. Mix with moisture content and other additions as you prefer.

Ironton engineers will visit your foundry and show your men how to use **Ironton NOJOINT** and where. Write or call today for the latest bulletin and additional information.

SINCE 1917 THE IRONTON FIRE BRICK COMPANY IRONTON, OHIO

1313 Ashtabula Street

Write or call Ironton collect for name of nearest representative.

Circle 678 on Page 53

nual capacity of about 700 tons.

Built in 1770 by Mark Bird near the site of his father's earlier forge, Hopewell prospered for nearly 70 years. Then coke-fired hot blast ovens began to replace the charcoal burning furnaces, and in 1883 Hopewell was "blow'd out" for the last time.

Many years later, the National Park Service acquired the area's approximately 850 acres. The original character of the village had changed so little that the park service decided it held fascinating possibilities for restoration.

Because Hopewell Village, isolated in the hills back of the Schuylkill River, became a ghost town, it remains today, since the restoration, much as it was when the blast roarer and flames lit up the sky for miles around.

At the brink of a natural embankment is the stone furnace from which molten metal spilled into molds of scorched sand called sows and pigs. Across the roads are the preserved buildings—the office and store, the big house where Mark Bird and later ironmasters lived, and, down the road past the blacksmith shop, stone houses which were inhabited by the workers.

Workers Had Hard Life

Feudal in character, such isolated ironmaking communities resembled in many ways the pattern of the self-sufficient plantation. Production was not based on slave labor, but the gulf between ironmaster and workers was deep and the life of the laborer a hard one.

Along the roads from the ironworks to the outside world, heavy freight wagons, or Conestogas, transported merchandise and produce to and from Philadelphia. Pig iron, castings, and bar iron were hauled in open carts over tortuous roads. The cost of transportation was exceedingly high. One ton of pig iron which sold for two pounds at Colebrookdale Furnace cost from one to two pounds to transport to Philadelphia, only 40 miles away.

Blast furnaces were designed primarily to produce pig iron for nearby forges, but the growing need for finished castings made it profitable to concentrate more and more on their production. With the completion of the Schuylkill and Union

In Chattanooga, a steel foundry reports

USING CARO-LINE 15 YEARS

because NOTHING ELSE WORKS AS WELL

LESS SLAGGING-
33⅓% ADDED LIFE

Nobody watches production developments more keenly than our customers in Chattanooga. Because they are always looking for betterments and economies in pouring operations, they have tried many ladle lining mixes over the last 15 years. Comparisons prove that the best lining for ladles handling acid electric steel is ganister in

IRONTON CARO-LINE

A detailed report on the lining mix, pouring temperatures, etc. is available from Ironton. Ask how you can test **Ironton CARO-LINE** in actual service in your foundry without obligation. You'll be smart to switch to this RELIABLE REFRACTORY.

SINCE 1917 THE IRONTON FIRE BRICK COMPANY IRONTON, OHIO

1313 Ashtabula Street

Write or call Ironton collect for name of nearest representative.

Circle 679 on Page 53

Canals, Hopewell found a ready market for all the finished castings it could produce, in Philadelphia, New York, Wilmington, Baltimore, and even more distant points.

Hopewell Village presents an authentic display of life in an ironmaking community of colonial and early America. It offers a picture of the humble, but ingenious beginnings in our country of basic industrial enterprise and provides a striking contrast for measuring the growth and the magnitude of the modern iron and steel industry.

Cast Bronze Bearing Design Manual Approved by Institute

New technical manual of the Cast Bronze Bearing Institute was approved by members at a meeting in Chicago on April 13. Containing some 70 figures and charts, the manual covers the entire field of full-film, complete boundary, and mixed film sleeve bearing applications.

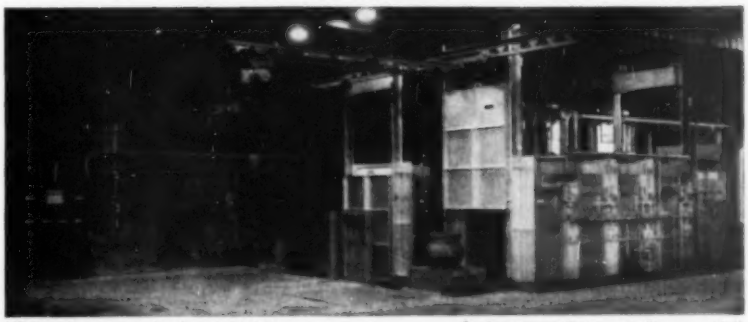
It also includes sections on lubrication, bearing materials, and practical considerations such as methods of retaining bearings in housings, and bearing and journal hardnesses and surface finishes. The manual is expected to increase markedly the application of cast bronze bearings because it simplifies radically the designer's work by taking guesswork and rule-of-thumb factors out of sleeve bearing design.

Copies will be available through institute members and the organization's office, 1604 Chicago Ave., Evanston, Ill.

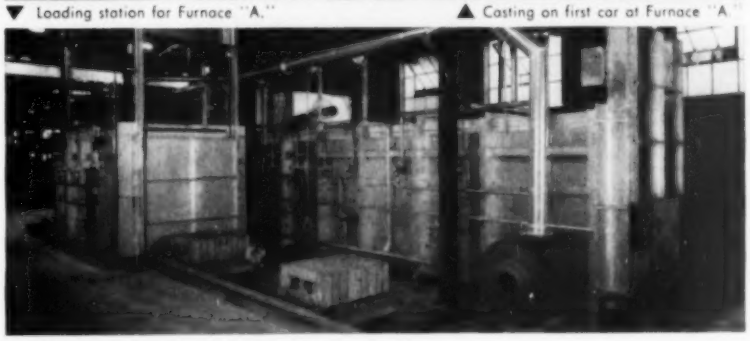
Zirconium Association Formed To Promote Use of the Metal

A group of companies that produce, melt, and process zirconium recently formed the Zirconium Association to expand the uses of the metal and to establish a focal point from which greater and more close co-operation could be developed between industry and governmental agencies, particularly the Atomic Energy Commission. The association office is at 2130 Keith Bldg., Cleveland 15. W. B. Thomas of Thomas Associates Inc. is executive director.

this Waltz continuous car furnace is delivering 50% more production than guaranteed

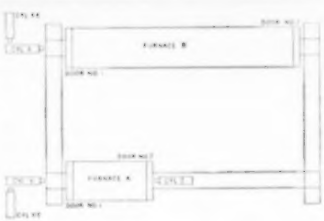


▼ Loading station for Furnace "A."

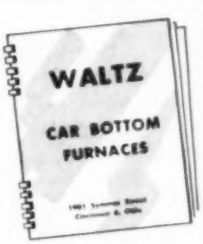


▲ Casting on first car at Furnace "A."

One of the Midwest's largest foundries reports this exceptional performance from this Waltz continuous car furnace especially designed for them. This installation anneals, preheats before welding and stress relieves after welding in a "push-button" operation. As shown in diagram Furnace "A" is the welding preheat furnace, and holds five cars. The operator pushes a button and #1 door on Furnace "A" will open, and when fully opened a car will come out of the furnace.



The operator removes a casting, pushes the return button, and the car goes back into the furnace and the door closes. When this casting is welded, a button is pushed for Furnace "B," which will open #1 door, and when that door is completely opened a car will come out and the welded casting is placed on this car. A return button is pushed, and the car goes back into the furnace and door #1 closes. This procedure is followed until all the castings on the first car in Furnace "A" are welded and moved to Furnace "B." The empty car from Furnace "A" is then transferred and pushed into Furnace "B." While this is being done, another loaded car is pushed into Furnace "A." This procedure is followed until all the castings are finished welded and moved to Furnace "B."



Waltz Furnace Company
Dept. E, 1901 Symmes St., Cincinnati 6, Ohio
Please send me without obligation this new 33 page illustrated book, with photos and technical description of this furnace and 13 other WALTZ car bottom furnaces.

NAME _____
COMPANY _____
ADDRESS _____
CITY _____ ZONE ____ STATE _____

Waltz FURNACE COMPANY
Symmes Street • Cincinnati, Ohio

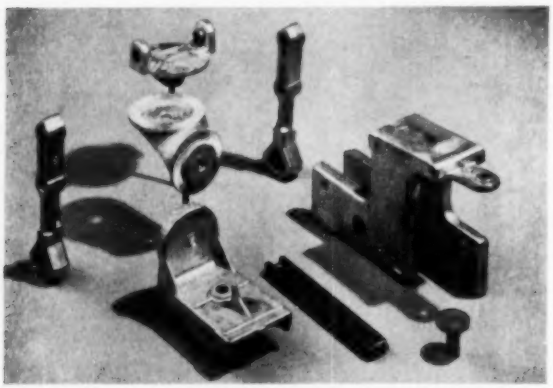
Circle 680 on Page 53

The Shakeout

Chain Saw Sharpener Features Diecast Parts

A TOTAL of seven diecastings form practically the entire assembly of the new File-N-Joint chain saw sharpener made by Nygren Industries Ltd., Richmond, Calif.

To provide a method of sharpening the various chains on different makes of saws and to accommo-



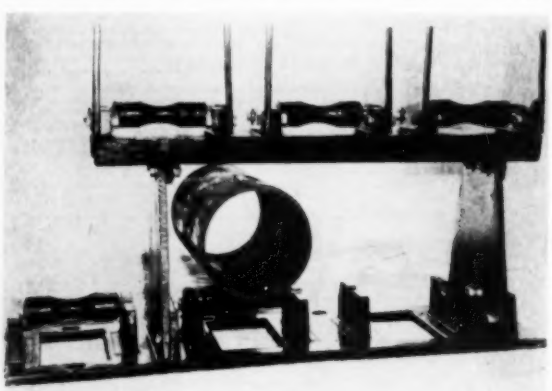
date all files used to do the job on such chains, the sharpener has been designed with great flexibility of adjustment.

Nygren engineers specified diecastings for the principal components to minimize the number of parts required and to eliminate elaborate machining or other secondary operations prior to assembly. Because of complex shapes possible with diecastings, one part serves in place of several required by other production methods. The large anchor block diecasting is aluminum, and the others are zinc. All are produced by a member company of the American Die Casting Institute.

For More Details Circle No. 518—Page 53

Ductile Iron Castings Support Power Cables

ASSEMBLIES of ductile iron castings totaling 100,000 lb are being used by Consolidated Edison Co. of New York to lay 69-kv cables across the Queensborough



bridge. These cables will link a power substation in Queens with a Manhattan substation across the East River.

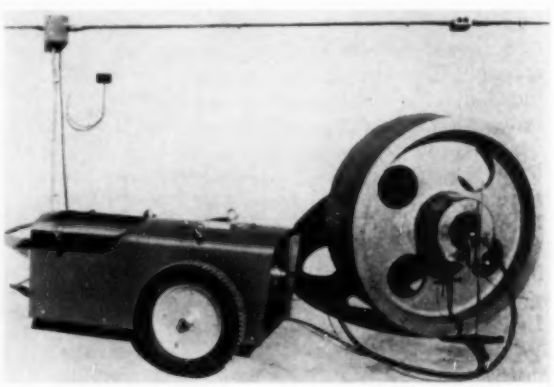
The feeder cables are housed in 8-in. pipes, welded into continuous lengths, which will rest on the ductile iron support assemblies, each of which weighs about 250 lb. Each assembly includes six rollers, to support as many pipes, which are coated with a polyester lamination. The castings were produced by Crompton & Knowles Corp., Worcester, Mass., and the polyester lamination by its subsidiary, Carl N. Beetles Plastics Corp., Fall River, Mass.

Ductile iron castings were specified for the supports after cost studies showed that they would be more economical than welded assemblies, yet would possess the necessary corrosion resistance and the high strength required to withstand stresses induced by movements of the bridge.

For More Details Circle No. 519—Page 53

Cobalt 60 Inspection Is Remote Controlled

RADIOGRAPHIC INSPECTION of steel castings has been made easier, faster, and safer at the National Supply Co. plant in Torrance, Calif., where a mobile carrier provides remote control for positioning and



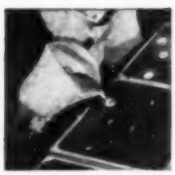
retracting a Cobalt 60 source from behind protective concrete walls 18 in. thick and 7 ft high. The enclosure is outdoors, and large parts are carried into it by truck through a gate or by truck-crane over the wall.

The mobile unit uses a flexible projector tube in which the Cobalt 60 source is guided to the point of use from a lead storage safe. A control unit on the end of a long, flexible, metallic cable is unreeled to a safe distance outside the enclosure. The projector tube is supported in proper position after the radiographic film is in place on the part to be tested. A manually operated crank and a gear wheel on the control unit operate a rack-type chain drive which propels the source through the tubing on the end of a flexible cable to the exposure point. Afterward, the crank operation simply is reversed.

For More Details Circle No. 520—Page 53

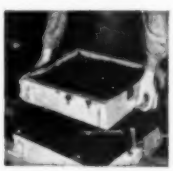
How to improve your aluminum, magnesium castings with B&A® Alkali Fluoborates

and Potassium Titanium Fluoride



In aluminum casting, use B&A Potassium Fluoborate as a purifying flux for removal of oxides. It is an excellent degassing agent, forms a dry dross, and improves fluidity of the molten metal.

Subsequent treatment with Potassium Titanium Fluoride, or a mixture of Potassium Titanium Fluoride with Potassium Fluoborate (for lower melting temperatures), produces a better grain structure in the metal. Improved grain refinement gives increased tensile strength, greater elongation, better machinability, etc.



In magnesium casting, use the B&A Alkali Fluoborates as oxidation inhibitors with both green sand and core sand. They help reduce rejects . . . cores are easier to make, faster to collapse, easier to shake out.

For further information, write or call your nearest B&A office. Ask for technical data on the use of B&A Ammonium Fluoborate, Potassium Fluoborate and Sodium Fluoborate in the light metals industry.

BAKER & ADAMSON® Fine Chemicals

Allied Chemical

GENERAL CHEMICAL DIVISION
40 Rector Street, New York 6, N. Y.

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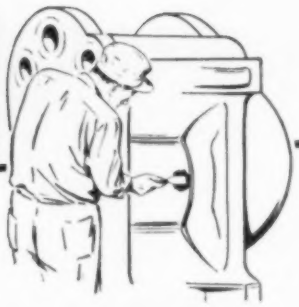
Circle 681 on Page 53



These features mean

BETTER LOOKING CASTINGS

TIGHT, LASTING REPAIRS

When correcting blow or sand holes, surface blemishes, or rough and porous areas in castings, you can depend on Smooth-On Foundry Cements, standard of the industry for more than 63 years. They are easy to apply, harden quickly, stay firmly in place.

THREE DIFFERENT SHADES

With 3 different shades to pick from, you know you can get a close match for your castings.

4AA—Light gray, fine texture
4A —Medium gray, medium texture
4B —Dark gray, coarser texture

UNIFORM QUALITY

Rigid quality control means you can be sure that the strength and color of Smooth-On Foundry Cements will not vary from one order to the next. Every lot of Smooth-On cements is laboratory tested and must satisfy tests for setting time, hardness, and color before it is packed for shipment.

FREE SAMPLES

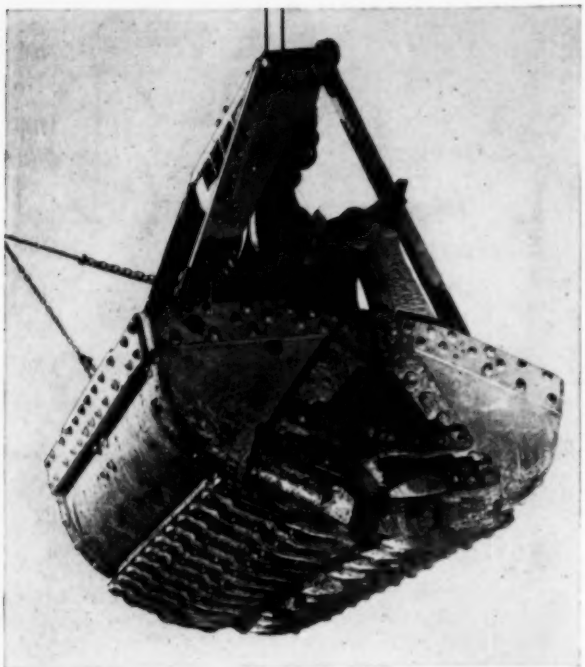
Why not try one or more of these Foundry Cements at our expense? We will be glad to send you a free sample of any of the cements described above if you will write us on your business letterhead. Write today, and see how Smooth-On can improve the appearance of your castings.

SMOOTH-ON MANUFACTURING CO.
570 Communipaw Ave., Jersey City 4, N. J.

SMOOTH-ON
FOUNDRY CEMENTS

SO-369

Circle 682 on Page 53



Blaw-Knox "Shark-Tooth" Foundry Buckets handle coke with minimum degradation!

Here is the bucket chosen by experienced Foundrymen. Designed and built to the specific requirements of Foundry operation, Blaw-Knox "shark-tooth" Buckets literally finger their way through coke, handle it with minimum degradation.

With quickly-attached liner plates, this versatile performer handles sand or other granular material without leakage. It's quick hook-on feature means that your crane is easily available for other Foundry Services.

An experienced Bucket engineer will be glad to study your operation, help you select the proper size, type and weight of Bucket for your operating conditions.

BLAW-KNOX COMPANY
Blaw-Knox Equipment Division
Pittsburgh 38, Pennsylvania

WRITE TODAY! You can get valuable engineering information on how to get improved Foundry operation with the help of Blaw-Knox Foundry Buckets. Ask for a free copy of Bulletin 2232-R.

BLAW-KNOX

Circle 683 on Page 53

GLUTRIN
LIQUID BINDER

GOULAC
DRY BINDER

For

CORE WORK, SAND FACINGS, SPRAYS

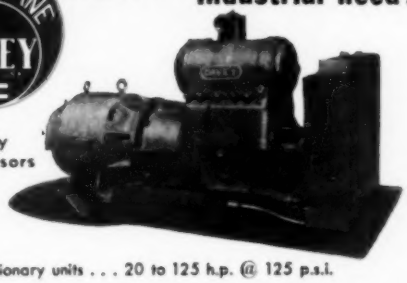
Write for pamphlets giving detailed information. Both materials carried in stock by America's foremost foundry jobbers

ROBESON PROCESS COMPANY
(Established 1905)
GENERAL OFFICES AND PLANT: • ERIE, PA.

HYDROVANE DAVEY

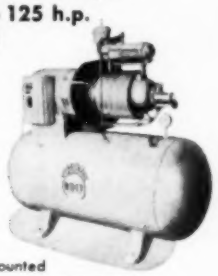
NEW... meets every industrial need!

Rotary Compressors



Stationary units . . . 20 to 125 h.p. @ 125 p.s.i.

- ✓ **Silent . . . vibrationless . . . compact**
- ✓ **Complete line . . . 2 to 125 h.p. . . . 8 to 500 c.f.m. @ 125 p.s.i.**
- ✓ **No complicated engineering . . . no compressor room . . . no foundation**
- ✓ **Easy to install and operate**
- ✓ **Air cooled or water cooled**



Tank mounted 2 to 5 h.p. @ 100-200 p.s.i.

Write for Bulletin M-132

INDUSTRIAL DIVISION

DAVEY — pioneers of "air-cooled air"

DAVEY COMPRESSOR CO.

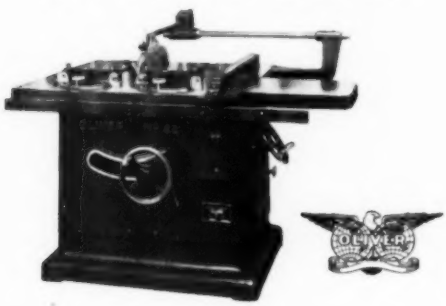
Kent, Ohio

Circle 685 on Page 53

"OLIVER" No. 88

TILTING ARBOR

MITER SAW



FINEST ACCURACY • MAXIMUM SAFETY

Fine engineering combines accuracy, convenience and safety. Base and baffle plates encase lower part of saw, assure safety . . . adjustable splitter prevents pinching of work after cut . . . overhead cage guards top of saw in tilted positions. Up to 18" diameter saw size . . . miters and dadoes at square or any angle to 45 degrees. Send for folder giving technical details.

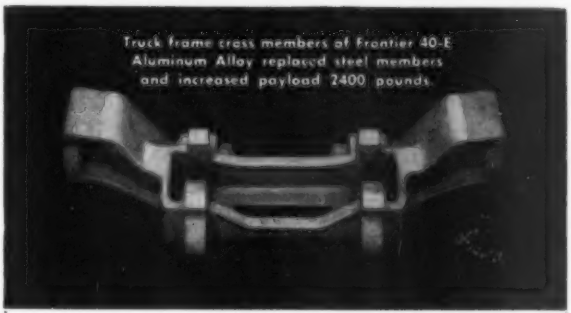
OLIVER MACHINERY COMPANY

GRAND RAPIDS 2, MICHIGAN

Circle 686 on Page 53

MORE PROFIT... for Both User and Producer

when you sell **FRONTIER 40-E** Aluminum Alloy CASTINGS!



Truck frame cross members of Frontier 40-E Aluminum Alloy replaced steel members and increased payload 2400 pounds.

Sell Castings

ENGINEERED TO THE JOB—

Sell Customer Service

When customers ask for light weight castings, don't just think of aluminum. Do a selling job. Ask about strength requirements. Would shock resistance be an advantage? How about corrosion resistance? Must the casting withstand high pressure? Talk about weldability and machinability.

Then recommend Frontier 40-E, the self aging, high strength aluminum alloy that has all these desirable features. Being a primary ingot, it is more reliable and can be counted on to give the same results day after day — year after year.

Do more than offer just another casting. Get out of the rut. Offer better castings with better design factors — castings made of Frontier 40-E — formulated to give 25,000 lb. yield strength. We'll back you up with our complete engineering and laboratory service. We'll start you on the road to *more and better* casting business.

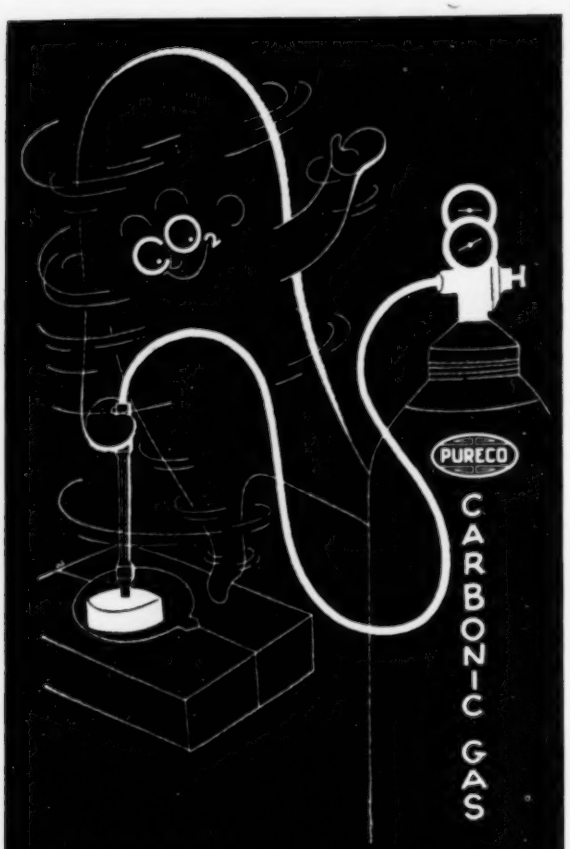
Write for complete information today.

FRONTIER BRONZE CORP.

4878 PACKARD ROAD • NIAGARA FALLS, NEW YORK

Exclusive Foreign Producers of 40-E
Doralum Castings Ltd., Darlington, England
Paul Bergsoe & Son, Glostrup, Denmark
L'Aluminum Francais, Paris, France

Circle 687 on Page 53



PURECO CO_2 HARDENS MOLDS AND CORES IN SECONDS—WITHOUT BAKING

Your plant will turn out more work in less time with CO_2. Let PURECO tailor a CO_2 installation to meet your specific foundry requirements . . . large or small . . . job shop or production line.

Call your nearby Pureco office for information on the complete line of CO_2 equipment and CO_2 supply systems—cylinders, high pressure receiver tubes, converters, receivers—all described in Bulletin #27. Write for your copy.

PURECO CO_2

Pure Carbonic Company

A Division of Air Reduction Company, Incorporated

150 EAST 42ND STREET, NEW YORK 17, N. Y.

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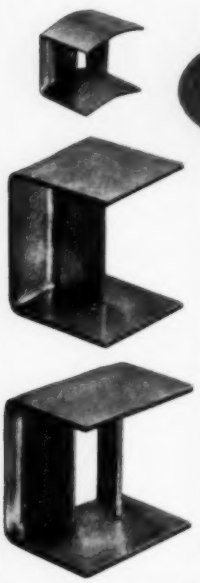
WHY POUR YOUR PROFITS AWAY?

save up to 50% on chaplets



Buffalo **ECONOMY CHAPLETS**

Now you can save up to 50% on chaplet costs with Buffalo Patented Angle Stem and Double Angle Chaplets. They burn in more easily, without chilling. They are thoroughly coated to assure instant fusion with molten metal. And the unusual strength of the one-piece design permits fabrication in thinner gauges. All these features mean *savings to you.*

Furnished in a complete line of sizes and gauges, Buffalo Economy Chaplets are available in tinned steel, Monel, stainless steel and copper. Why not give them a trial? It costs only pennies to find out how many dollars you will save.

Write for literature on Economy Chaplets. For information on the complete "Buffalo" line, request Catalog No. 20.

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Combined **SUPPLY & EQUIPMENT CO., INC.**

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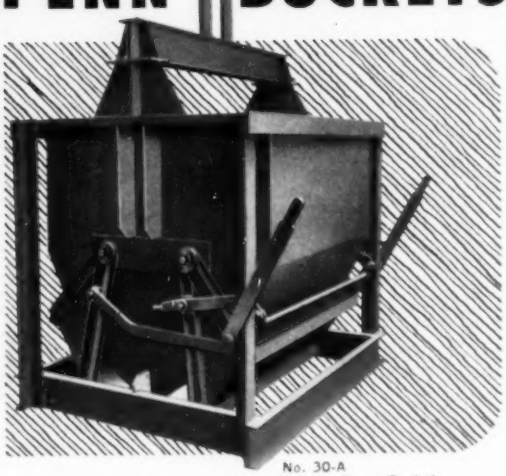
PENN BUCKETS



No. 30-A
Bottom Dump Bucket

Exclusive design makes this bottom dump bucket easy to operate . . . easy to open. Efficient for foundry use in handling all types of sand, moulding or core, dry or prepared. Can be used with coke, scrap iron and castings also. Sizes 7 to 200 cu. ft.

Write Today for Catalog • Prices Quoted on Application

PENN IRON WORKS, INC.

READING, PENNA.

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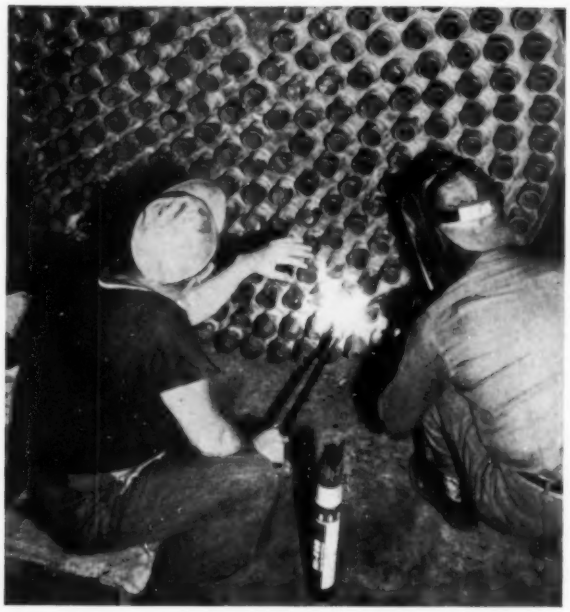


Tack-welding cast iron cones to carbon steel vortex tubes of gas scrubber. Ni-Rod "55" Electrodes make ductile, crack-free joints. Scrubbers made by Aerotec Corp., Greenwich, Conn.

Weld cast iron to carbon steel ...No preheat...no cracking... with Ni-Rod "55" Electrode

Joints were cracking up – between cast iron cones and carbon steel tubes in these gas scrubbers. Welds made with iron and mild steel electrodes were just too brittle – they cracked when chipped, broke when shipped.

Weldors switched to Ni-Rod "55"* Electrodes, and now they're standard. Why? Steven Paulo, Aerotec Superintendent says, "I've never seen a crack in a Ni-Rod '55' weld. And any weldor with normal skill can do a good job." Ni-Rod "55" offers you another big advantage – rarely do you have to pre-heat.

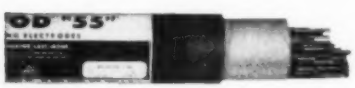
You can get trouble-free welds between cast iron and mild steel in all your jobs – with Ni-Rod "55" Electrode; available from most jobbers.

See in Inco's booklet "Repair Cast Iron Parts Quickly and Easily" how other shops pare costs. Yours for the asking.

*Registered trademark

THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street — New York 5, N. Y.

INCO



INCO WELDING PRODUCTS

ELECTRODES • WIRES • FLUXES

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COB GRITS

For Airless Blast Cleaning & Metal Finishing—Also COB FLOUR—
U. S. STD SCREEN ANALYSIS: 40-200.

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P.O. BOX 185 TIPTON, INDIANA
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Circle 692 on Page 53

STEEL FOUNDRY PRACTICE

By John Howe Hall

496 PAGES 6x9 CLOTH BOUND PRICE $12. POST PAID

This book contains practical information on almost every production problem steel foundrymen encounter. The easy-to-read text is accompanied by over 250 detailed charts, drawings and illustrations.

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Top Performance

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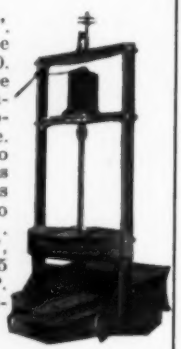

TYPE "CS". Complete price $395.00. 24" square sieve. A continuous operation sieve. Requires no dumping, as refuse is ejected off to one side. Height 4'10", weight 295 lbs, ⅓ H.P. enclosed motor.

TYPE "CR". Complete price $385.00. 24" dia. round sieve. Sifts, fluffs, mixes, aerates sand. Height 4'6", weight 250 lbs., 1/3 H.P. enclosed motor.

TYPE "HL". Price $285.00 complete, less sieves. Laboratory model especially designed for laboratory sand control, fitted with 1/6 H.P. enclosed motor.

PROMPT DELIVERY from your Foundry Supply House

TYPE "V". Price, 20" Sieve, $300.00. Does the work of 10 men, Screens sand, Fine, Medium, and Coarse. 20" dia. sieve with special clamp for 5-second changes. Height 4'6", weight 100 lbs., fully-enclosed 1/6 H.P. motor. Also available in Giant V-5 with 36" sieve for triple capacity . . . Price $545.00.

MAIL THE COUPON NOW!

GREAT WESTERN MFG. CO.

Leavenworth, Kansas **Phone MU-22291**

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CENTRIFUGAL CASTING INCREASES PRODUCTION

You can save as much as 25% in labor costs while increasing your production as much as 35% by making castings centrifugally. Highest quality castings, a minimum of rejects, and use of unskilled labor contribute to more profitable operation. It will pay you to ask for complete information.

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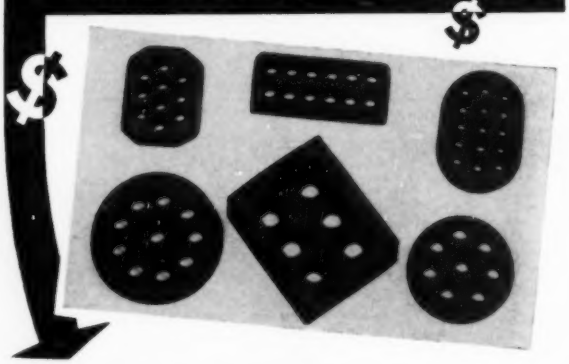

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Transfer Fluids Fast

—LIKE GAS IS PUT IN YOUR CAR!

THE NAME IS FAST-FLO! It's Graco's light-weight air-powered pump that transfers fluids fast, "direct-from-drum"!

Just stick the Fast-Flo in the drum, attach plant air line. Open gasoline type valve at end of hose to start pump. Close valve, and pump stops. One-man operation, with absolute control *at the valve.*

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A NEW COST MANUAL

for the

Gray Iron Castings Industry

(NO. 2)

Here in 120 carefully planned pages is a complete Cost Account System for both a small foundry with minimum accounting facilities and a large foundry capable of detailed cost determinations for accuracy and completeness.

Price $10.00 Postpaid

Two cost manuals under one cover—Cost Manual No. 1, representing twenty years of editing and revising by practical operating experts in the industry, is included as a supplement.

The more thorough treatment of the subject found in the new manual was dictated by the considerations of economy in dealing with the higher priced labor and material factors and a relentless desire to probe for hidden costs from wasteful and nonprofitable activities.

GET YOUR NEW COMPLETE COST SYSTEM FOR FOUNDRIES

FOUNDRY, Book Dept., 1213 W. 3rd St.
Cleveland 13, Ohio Date_____

Please forward one copy of COST MANUAL NO. 2, at $10.00 postpaid. ☐ Check enclosed.

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Orders for delivery in Ohio—add 3% sales tax.

You get MORE with

MOROC®

the controlled silicate CO_2 binder

MORE SPEED. Curing time ranges from ten seconds to three minutes, depending on type of mold or core.

MORE LABOR SAVING. Cores are ready for use when they come from core box. You eliminate movement to and from ovens, handling of core driers, cementing of halves.

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MORE PROFIT. With MOROC you can get this extra capacity and flexibility with a smaller investment in equipment than would be required for additional ovens or shell-molding equipment.

MOROC COMES IN FOUR GRADES

MOROC 1. High-strength binder.

MOROC 2. High-strength and good collapsibility.

MOROC 3. High-strength and high collapsibility to meet demands of core-blowing equipment.

MOROC 4. Extra-high collapsibility and good flowability.

Write for complete information. Diamond Alkali Company, 300 Union Commerce Building, Cleveland 14, Ohio.

Diamond® Chemicals

Circle 699 on Page 53

CLASSIFIED ADVERTISING

Help Wanted

SALES MANAGER FOUNDRY

Division of A.A.A. National Corporation requires a top sales executive to plan and direct all sales activities of this Division's medium-size foundry. Sales experience must have been in high alloy stainless heat and corrosion-resistant castings. Location in Western New York State. Executive type fringe benefits. Response to qualified applicants only. Forward detailed resume, including past earnings, to:

BOX 527, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

FOUNDRY SUPERINTENDENT

Well established and rapidly growing jobbing foundry in New England producing general run aluminum and bronze sand castings but specializing in nickel alloys and stainless steels operating two shifts with about 60 men needs experienced, intelligent and progressive superintendent who can control quality, costs and production. Write giving qualifications in detail and salary requirements.

BOX 530, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

MELTING SUPERINTENDENT BACKGROUND IN METALLURGY

Gray iron foundry in Michigan losing Melting Superintendent through retirement. Replacement should be 30 to 45 years old, experienced in both cupola and electric furnace operation, with academic or considerable practical background in metallurgy. Reply giving age, resume of experience, education, personal background and salary requirements.

BOX 533, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

FOUNDRY SALES ENGINEER

For gray iron and alloy iron castings. Age up to approximately 40. College graduate, or equal foundry technical and practical experience will be considered. Midwest. Car necessary. Very limited travel required. Will give adequate inplant and sales training for trainee. Salary open. All replies held in confidence. Address: Box 556, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SALES ENGINEER

High alloy and stainless steel castings. Must be graduate metallurgist with some sales experience. Send complete resume with photo if possible and include salary desired. Excellent opportunity with old and well established foundry located in Midwest producing high and low alloy as well as carbon steel castings. Address: Box 535, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOREMAN

Well experienced in making centrifugal castings. Prefer man 25 to 35 with some technical and metallurgical training willing to work with pouring crew, gradually assuming foremanship. Opportunity for energetic, capable person with organizing abilities to advance to superintendent of well established foundry on Pacific Coast. Address: Box 565, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SALES ENGINEER

Experienced in steel castings. Chicago and surrounding area. Good opportunity for right person. Address: Box 546, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Help Wanted

METALLURGIST, FOUNDRY

Foundry metallurgist with B.S. degree, or equivalent technical knowledge, with experience in cast iron foundry operations. Must be capable of establishing controls for melting and supervising expanding metallurgical laboratory. Should be interested in attractive, long-term opportunities with medium size manufacturers. Salary open depending on experience. Fringe benefits above average, with noncontributory surgical, hospitalization and profit sharing program.

BOX 544, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

METALLURGIST, MAGNESIUM FOUNDRY

LARGE, LONG ESTABLISHED SOUTHERN CALIFORNIA MAGNESIUM SAND CASTING FOUNDRY WANTS QUALIFIED MAN WITH KNOWLEDGE OF GATING AND RISERING TECHNIQUES TO ASSIST IN THE PRODUCTION OF AIRCRAFT QUALITY MAGNESIUM SAND CASTINGS. SEND RESUME OF EXPERIENCE AND SALARY EXPECTED.

BOX 522, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

MOLDING SUPERVISOR

Progressive foundryman needed to assume complete responsibility for all molding operations, in Central Ohio firm producing gray iron, alloys, and ductile iron; minimum of 5 years' experience in supervision. Synthetic sand and incentive shop experience necessary. Castings to 5 tons. Good opportunity. All replies answered and confidential.

BOX 541, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

MELTER ASSISTANT FOREMAN

Must have experience in melting of all nonferrous materials, as well as experience in gas and oil fired crucible type furnaces and familiar with refractories. Important: Man must be good organizer. This is available in the Mid-West area for the right man.

BOX 531, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

SUPERINTENDENT

Thoroughly versed in all phases of production including shell molding of small stainless steel, monel, stellite and ductile iron castings of aircraft quality. Prefer man with metallurgical background and years of practical experience. Must know induction furnace melting. Excellent opportunity for ambitious, energetic person to develop a new division of a well established foundry in California. Address: Box 564, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SUPERVISOR

Small nonferrous foundry in Northern Ohio using sand, CO_2, shell and centrifugal molds needs experienced supervisor preferably with metallurgical background. Must have first hand experience in handling 20 to 35% leaded bronze. No others need apply. Address: Box 545, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY SUPERINTENDENT

Small squeezer gray iron foundry in Southwest Michigan desires man to take complete charge of matchplate production. Must know cupola practice, sands, gating, patterns, core and cleaning room. Employment 50 men, steady production 18-25 tons per day. Excellent opportunity for qualified person. Give references, experience, availability date and salary expected. Address: Box 537, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

PRACTICAL FOUNDRYMAN

Experienced in all phases of operation, for well-known consulting group. Must be willing to travel. Address: Box 548, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOREMAN

Jobbing steel foundry needs molding foreman. Must know heading and gating. Excellent opportunity for advancement. Address: Box 526, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Help Wanted

PLANT ENGINEERS

Experienced on layout of all types of foundry equipment, material handling and material flows. Send complete details on work history, education and family status. Include recent photograph. All replies confidential.

BOX 542, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

OPPORTUNITY

A well-established Midwestern (Chicago area) gray iron foundry—capacity 400 to 500 tons per month of castings running from a few pounds to several tons—requires services of a general manager. To qualify he must have a solid practical gray iron foundry background and be able to deal with very substantial customers. This is an excellent opportunity to take an active part in the management and if desirable, acquire a stock interest in a well established business with an excellent record dating back over 25 years. Replies will be treated very confidential.

BOX 557, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

IRON FOUNDRY METALLURGIST

Gray iron foundry requires metallurgist with some experience in the production of ductile iron in a basic cupola. Age 30 to 40 preferred. Progressive company situated in Southwest. Address: Box 552, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SUPERINTENDENT

Capable of running aluminum and bronze jobbing foundry—must be willing to work with newest processes—well established company—profit sharing plan. Address: Box 540, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Positions Wanted

FOUNDRY EXECUTIVE

PRESENTLY EMPLOYED BY 100 TON PER DAY GRAY AND NODULAR IRON FOUNDRY AS ASSISTANT SALES MANAGER. SOUND TECHNICAL AND PRACTICAL BACKGROUND AS MOLDER, COREMAKER, ASSISTANT SUPERINTENDENT, CHIEF METALLURGIST AND RESEARCHER IN SHELL, CO_2, NODULAR, ETC. GOOD ADVERTISING AND CONTACT PROPOSAL EXPERIENCE. ADDRESS: BOX 566, FOUNDRY, PENTON BLDG., CLEVELAND 13, OHIO.

FOREMAN OR GENERAL FOREMAN

Young aggressive foreman desires position in molding or core room departments. Experienced in steel and iron, graduate apprentice, journeyman, and foreman background. Willing to relocate. Address: Box 539, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

ENGINEER-ASSISTANT SUPERINTENDENT

Graduate engineer, age 28, practical and technical experience in all phases operations and controls gray iron and Meehanite jobbing foundry. Now employed as superintendent. Desire position with management potential with progressive ferrous foundry. Address: Box 555, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRYMAN

Young, 12 years' experience ferrous and nonferrous metals capable of taking complete charge, seeking responsibilities and opportunity. Address: Box 563, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

METALLURGIST

Young graduate engineer. Four years experience in quality and cost control of gray and nodular iron. Desire better opportunity. Any location. Address: Box 525, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

MANAGER-SUPERINTENDENT

Nonferrous, ferrous, jobbing or production. Top qualifications and references. Address: Box 549, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Positions Wanted

SUPERINTENDENT OR MANAGER

Practical foundryman, nationally known for a job well done. Age 46, good health, now employed. Looking for more action, ferrous or nonferrous. Address: Box 520, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY SUPERINTENDENT

Thorough knowledge of all phases of nonferrous metals. Understand gating, jobbing, floor, machine and plumber supplies. Can also produce pressure tight and porous free castings. Know sand control and core room work. Address: Box 560, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY MANAGER

Twenty years' experience in supervising ferrous and nonferrous jobbing and production foundries. Metallurgical and sales background. Technical and practical experience. Age 47, now employed. Address: Box 558, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY FOREMAN OR ASSISTANT SUPERINTENDENT

Have 22 years foundry experience, with 13 years in supervision, in light and medium gray iron, jobbing and mechanized. Willing to relocate. Address: Box 528, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

PERMANENT MOLD ENGINEER

Graduate Metallurgist with 25 years' experience in light metal castings. Handle all phases of engineering or supervise complete operation. Interested in process development. Address: Box 554, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SUPERINTENDENT

Practical and technical 30 years' experience jobbing and production. Familiar with every phase of the foundry. Now employed. Address: Box 543 FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRYMAN

Graduate engineer with sound thorough background in ferrous operations. Age 32. Have supervisory experience in melting, molding, cleaning and quality control. Now employed as sales engineer. Desire to relocate from Middle West to West Coast. Address: Box 559, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

CORE DEPARTMENT FOREMAN

Thorough knowledge of all phases of core room, on blowers, rollover, etc. in steel and gray iron. Good labor relations and cost minded, 20 years in supervision. Address: Box 562, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SUPERINTENDENT OR MANAGER

Progressive foundryman familiar with every phase of practical experience on all classes of work. Now employed. Would like to make change. Address: Box 561, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY SUPERINTENDENT

With 35 years' experience operating iron and steel foundries. Desire to make change. Engineering graduate. Address: Box 536, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Foundry Consultants

HEVERLE & HAY
ENGINEERING—ACCOUNTING
CONSULTANTS TO INDUSTRY
(Since 1907)

COST CONTROL—COST REDUCTION
FOUNDRY METHODS

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FOUNDRY CONSULTANT—NONFERROUS

Sand — permanent mold — centrifugal permanent mold — and centrifuge permanent mold. High pressure castings a specialty. Address: ED JENKINS, 253—8th STREET, WEST PALM BEACH, FLORIDA, PHONE: TEMPLE 2-8685.

Opportunity

EUROPEAN
COMMON MARKET

STEEL CASTING COMPANY IN BELGIUM with machining and finishing facilities, specializing in large series of small and medium size parts up to 11 tons for the marine, R.R., mining, electrical and automotive industries, in Carbon and Alloy Steel,

SEEKS LICENSING AGREEMENT

from U. S. company to expand and diversify.

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INDUSTRIAL CONSULTANTS
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Representatives Wanted

SALES REPRESENTATIVES

Here is an established competitively-priced line you can count on for a good income. Milward Alloys, a leading manufacturer with a strong reputation is now in the process of localizing many sales areas to give better service to customers and prosepcts from coast to coast. A considerable number of territories are open. We need men who will take them on, full or part time.

You may now be serving the trade or you may have foundry experience. Maybe you're retired with time on your hands. Regardless of your situation, you will be amply rewarded—because Milward's line is broad and in constant demand. Milward alloys cut foundry costs. Orders are promptly filled. That's why we have a substantial reorder business.

The Milward line includes: copper shot; phosphor copper and other powerful deoxidizers and degasifiers; aluminum bronze and manganese bronze hardeners and ingots; copper silicon, copper manganese, copper iron, copper aluminum and copper chrome alloys; nickel copper and nickel iron alloys; aluminum titanium, aluminum silicon, aluminum manganese, aluminum iron and aluminum copper and other alloys.

Phone or send us a letter describing the area or locality you can cover, whether full or part time, and tell us a little about yourself . . . your qualifications, experience, and when available. This may well be the connection you've been waiting for. Write or phone: Mr. David B. Milward, President. Phones: Lockport, N. Y. 4-0435, or Buffalo, N. Y. LUdlow 6425.

MILWARD ALLOYS, INC.
Lockport, N. Y.

SALES REPRESENTATIVE

We are interested in securing the services, on a salary plus travel expense basis, of an aggressive sales engineer to contact and sell the foundry trade. Must have a metallurgical background or equivalent practical foundry experience. Our company is prominent in its field, presently selling a widely used product to all types of foundries.

Man desired should not be over 40 years of age, preferably 30 to 35, free to travel extensively. Headquarters in a medium size midwestern town with moving expenses paid.

Send complete resume on education and experience and salary requirements. All inquiries held in strictest confidence. Please reply to:

BOX 534, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

Representatives Wanted

MANUFACTURER'S REPRESENTATIVE
Molding Machines • Core Blowers

Leading manufacturer of molding machines and core blowers is searching for an established manufacturer's agent now engaged in sales and service to foundries in Texas, Louisiana, and Oklahoma.

This is an advanced, complete line of quality foundry machinery and a thorough knowledge of foundry methods and machinery application is essential.

Exclusive representation is guaranteed by manufacturer. There is no objection to agent handling other non-conflicting foundry lines.

Send complete resume—current representation, experience, principals, qualifications, etc. All replies shall be held confidential.

BOX 538, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

JOBBERS WANTED

We manufacture Kob-Kleen (ground corn cobs) for deburring, burnishing, polishing and soft grit blasting of metals, metal stamping absorbants, etc. Nationally advertised.

COEVAL, INC.
DEPT. H ST. JOSEPH, ILLINOIS

REPRESENTATIVE WANTED

We have several good territories open on our refractory cupola gun mixes for cupolas and ladles. Our products well established with some of largest users. Address: Box 551, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

REPRESENTATIVE AVAILABLE

Retired foundryman wishes to act as manufacturers' agent for foundry material, supplies and equipment. Address: Box 550, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Foundries Wanted

ALUMINUM FOUNDRY

Will set up permanent mold or die casting established or contemplated foundry for major interest. Can supply technical and management knowledge plus cash. Address: Box 524, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Employment Service

FOUNDRY PERSONNEL SPECIALISTS
National Placement and Procurement of
GENERAL AND PLANT MANAGERS, PLANT SUPERINTENDENTS, FOREMEN—ALL DEPARTMENTS, METALLURGISTS, ENGINEERS, CONTROLLERS, ACCOUNTANTS, SALESMEN, SALES MANAGERS, PERSONNEL DIRECTORS, PURCHASING AGENTS
Confidential Inquiries Invited
From Employers and Qualified Applicants
For Fast Competent Assistance Contact
DRAKE PERSONNEL, INC. **FINANCIAL 6-8700**
JOHN COPE, DIRECTOR 29 E. MADISON ST., CHICAGO 2, ILL.

Engineering Service

SPECIAL SERVICE . . .
You may have a PROBLEM which you have been UNABLE TO RESOLVE with your own organization personnel. A problem that could be QUICKLY SOLVED in a month . . . . a week . . . a day . . . BY A WELL-QUALIFIED MAN of experience. We have a man or men with many years of experience in the exact areas with which you are concerned. Representative areas include plant layout, modernization, operation, selection and installation of equipment, technical processes, metallurgy, personnel development, methods, etc. To help you, we assign individuals who have 40 or more years of actual experience in specialized fields . . . invaluable know-how, yours to command for as long as you need it. WRITE OR PHONE for detailed information.

WESTOVER SPECIAL SERVICE ASSOCIATES
3110 W. Fond du Lac Ave., Milwaukee 10, Wisconsin, Phone Custer 3-2121

MAGNESIUM PERMANENT MOLDS
Designed and Gated

Address inquiry to:

BOX 553, FOUNDRY

PENTON BLDG. CLEVELAND 13, OHIO

Wanted-To-Buy

WANTED
USED EQUIPMENT—GOOD CONDITION

1 Magnetic pulley approximately 12" x 12".
1 Core oven, gas fired, inside dimensions approximately 6' x 6' x 6', walk-in type, complete with core trucks and racks.
1—20 x 27 rubber belt Tumblast Wheelabrator or 27 x 36 Tumblast Wheelabrator.
1 Double end snag grinder, 5 to 7 H.P., that will take 2 x 14 or 2 x 16" wheels.
3 Small dust collectors, approximate H.P. ¾ and 1, approximate cfm 1200. We will take a range of 1000 to 1500 cfm.
1—2' x 4' Simplicity or other screen for scalping sand.
1 Climax #2½A wire scraper to accommodate 3/16" to ½" rod capacity.
1 slow rpm, approximately 75 H.P., air compressor, complete with controls and reduced voltage starter.
1 Sand muller BF #30 or #40 or Simpson model 1½F, 1000 pound batch.
1 Pouring device to handle 250 pounds of brass, and
1 Pouring device to handle 900 pounds of brass.

BOX 529, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

WANTED

Used or broken Silicon Carbide Grinding Wheels of any kind or size, regardless of bond. Will pay $35.00 per ton.

UNION MINING COMPANY
2306 FIRST NATIONAL BANK BLDG.
PITTSBURGH 22, PENNSYLVANIA

WANTED TO BUY

A used Simpson sand mixer Model No. 2H or F. State condition and price for immediate acceptance. Address: Box 523, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Wanted-To-Buy

IF YOU OPERATE
A FURNACE

We will purchase your scrap linings, retorts, conveyors, muffles, racks, etc. Any item made of nickel alloy. Write, Wire or Call:

WEINSTEIN COMPANY
610 W. 8th STREET
JAMESTOWN, NEW YORK
PHONE: 61-134

MIXER WANTED

Used Simpson Intensive Sand Mixers. State size, condition and lowest cash price for immediate acceptance. Address: Box 578, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Foundry For Sale

FOUNDRY FOR SALE

Gray iron, 5,000 sq ft., located in Fairfield, Ill., new, built less than a year ago. 10 ton capacity, fully equipped. Would sell all or part. Work available. Address: Box 532, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

For Sale

FOR SALE
MOTORS—GENERATORS
TRANSFORMERS
Unused—Rebuilt
WORLD'S LARGEST INVENTORY
ELECTRIC EQUIPMENT COMPANY
Phone station Collect GLenwood 3-6783
P. O. Box 51 — Rochester 1, New York

For Sale

SAND BLAST EQUIPMENT
SELL-BUY-TRADE
GUARANTEED MACHINES
TERMS: 3 YEARS TO PAY

$70,000 worth new Pangborn and Wheelabrator parts. Priced 25% less than list.

6' LF-14 Pangborn Table	$2200.00
9' LG-14 Pangborn Table	4500.00
4' LF—Pangborn Table	2500.00
Pangborn 14 GK Barrel	2500.00
Pangborn 8 x 8 Room	2800.00
Pangborn 53 EN2 Hand cabinet	325.00
Pangborn Auto Peening cabinet	1100.00
48 x 48 Wheelabrator Tum. w/loader	4500.00
42 x 48 Wheelabrator Tum. w/loader	2500.00
15 x 20 Wheelabrator	1800.00
8' Wheelabrator Table Blast	2000.00
72" American Table Room	4800.00
14 LG5 Pangborn Rotoblast Multi-table 4/5—5' tables	9000.00
Pressure Tanks, all types	150.00 up
Vapor Blast cabinets	400.00

All types and sizes of Hand Cabinets, Dust Collectors, Pressure tanks, Rooms, Horizontal or vertical Tumbling Barrels and additional Sand Blast Equipment too numerous to mention.

DIAMOND SALES, INC.
5654 W. Jefferson
Detroit 9, Michigan
VI-3-6750

FOR SALE

Complete sand cast aluminum foundry equipment consisting of:
3—Osborn Squeezers
75—Slip Flasks, Hines and Fremont
1000—Bottom Boards
1—100# Tilting Furnace
1—450# Dip Out Furnace
1—Large Metal Cutting Band Saw
1—Air Compressor
1—Belt Grinder
Several Wood and Aluminum Floor Flasks, Misc. Tools, Benches, Ladles, etc.
Price $4500

Complete pressure casting equipment for casting aluminum matchplates and core boxes in plaster, consisting of: cast iron flasks, 2 gas fired ovens with rollout cars, cavity frames, melting furnace, pouring device, lay-out plates, benches and other equipment.
Price $4500

Will sell this equipment in two lots or altogether with foundry building and modern six room home for $25,000.

SWEETSER ALUMINUM FOUNDRY
SWEETSER, INDIANA
PHONE 2322

FOR SALE

1—Simpson #0 Muller—Style M (never used).
1—Lancaster Stainless Steel Counter - Current Batch Mixer, Type LW-62.
1—Lancaster Mixer, Model EBG-4.
1—Lancaster Mixer, Model EAG-3.
1—Ingersoll Rand Air Compressor, Type PRE-2. 24" x 15", 100# pressure with 300 HP motor.
3—Link Belt Roto - Louver Rotary Dryers. Models, 207-10; 310-16 and 502-20.

R. GELB & SONS, INC.
U. S. HIGHWAY 22, RAHWAY VALLEY R.R.
UNION, NEW JERSEY

FOR SALE

1000 series Reda Gas Furnace. Excellent condition. Will include all new parts necessary for conversion to oil. $2,000 F.O.B. Mankato, Minnesota.

LITTLE GIANT, INC.
126 WEST ROCK STREET
MANKATO, MINNESOTA

CENTRIFUGAL INDUCTION MELTER

ECCO 16 KVA induction furnace, multi-gap type, complete with linked centrifugal casting machine. Semi-automatic operation. All equipment recently over-hauled. Located Midwest. Asking $2500.00. Address: Box 547, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOR SALE

Two Lindberg radiant fired electric furnaces complete with controls 440 V. 50 KW. Address: ALUMINUM MATCH PLATE CORP., 1500 MILITARY ROAD, BUFFALO 17, NEW YORK.

For Sale

FOR SALE

Fisher Furnaces #600 MNP
Fisher Furnaces #400 MNP
Campbell-Hausfeld Tilt Furnaces
Campbell-Hausfeld Stationary Furnaces
Stedman Core Crusher, Hammer Mill
Skip Hoist for 9½ Foot Cupola—complete
Osborn #405 Rollovers
Mold conveyor 268' long
Elevators
Belt Conveyors
Vibrating Screens
International Rollover RES
Milwaukee 163 Jolt Stripper
Champion JSL 12 Pin Lift, jolt
Osborn 710J, Pin Lift
Osborn 212J Jolt Squeezers
Osborn 275J, Jolt Squeezers
Osborn 276J, Jolt Squeeze
International LSJ, Jolt Squeeze
International PJS, Jolt Squeeze
Milwaukee 104 Jolt Squeezers
Champion JS 108 Jolt Squeeze
Arcade 1008 Jolt Squeeze
Spo 110 Jolt Squeeze
International Rollover 2410 G portable
International Rollover 30 x 8 no jolt
J & J 610 rollover portable
International pin lifts
Davenport pin lifts
Osborn 559 pin lifts
Spo 506 jolt rollover, pin lift, draw
International Type R core rollover, hand
Swing Grinders
Royer sand preparators
B & P preparators
Blystone sand mixers
American Sand Cutters, Models M, AM, AA
Coleman core ovens
Grinders ½ hp to 25 hp
Disc grinders
Ladles from 50 to 10,000 lb.
Pouring Devices 500 lb. to 2000 lb.
Gyratory riddles
Monorail and bridges
Air Hoists 250 lb. to 10,000 lb.
Overhead chain conveyor #458, track, drives
Blowers-Centrifugal-positive-exhaust
Dust collectors all sizes

FLASKS
ALUMINUM
SLIP and POP
Sizes from 10" x 10" to 48" x 48"

JACKETS
Aluminum and Iron

STEEL FLASKS
Sizes from 10" x 15" to 9' x 9'

CORE PLATES
Transite—Iron

MANY OTHER ITEMS IN STOCK
SEND US YOUR INQUIRIES
WE BUY—SELL—TRADE

THE HOMAN MACHINERY CO.
1144 HARRISON AVE. MAIN 10339
CINCINNATI 14, OHIO

For Sale

FOR SALE

Robins Floatex Shakeout Unit 5' x 6' 12,000# cap. New 1951
Hough HA Payloader, 1951, Rebuilt engine, pneumatic tires
Jeffrey Vibrating Feeder 10' x 12' with 2.5 KW power supply, new 1950
Yale & Towne 3 Ton "Cable King" Hoist with pendant & trolley
Link Belt Steel Apron Conveyor 20' x 24' with Link Belt Speed Reducer & 5 HP TC motor for use under sand bin.
Chaplets, 4000# tinned steel, purchased from iron foundry that ceased operations, selling at 30% of list, min. order 100#

MEECH FOUNDRY, INC.
9906 MEECH AVENUE
CLEVELAND 5, OHIO
MICHIGAN 1-5550

REPAIR AND REBUILDING SERVICE ON ALL PNEUMATIC TOOLS

We try to carry a complete line of "Hard Chrome Rebuilt Tools" at about half the cost of new tools. Before you discard your old tools, why not send them to us for our estimate on the cost of renewing them with our Hard Chrome Process?

CENTRAL PNEUMATIC SERVICE COMPANY
512 LINDEN AVENUE
DAYTON 3, OHIO

FOR SALE

OSBORNS, SPOS, INTERNATIONALS, DAVENPORTS, TABORS, practically all models, some never used, some rebuilt, some "jalopies," but all as represented or your money refunded with no questions.
HOUGH PAYLOADER Model HA ½ yd. completely rebuilt and guaranteed.
SKIP-HOIST CHARGER for 30-36" Cupola, with motor and controls.
ROBINS SHAKE-OUTS (2) 3' x 4' with motors and controls.
MAGNETIC PULLEY (12" x 24") has to be energized.
JEFFREY MOLD CONVEYOR—used approximately two years, splendid buy.
MODERN Cylindrical Ladle (750# cap.) Never used. (Does not have raising and lowering device)
Other good equipment—send us your inquiries.

W. O. McMAHON
BOX 5799, HOMEWOOD STATION
BIRMINGHAM 9, ALABAMA
Phones: TRemont 1-2088 or 9-6179

For Sale

FOR SALE

1—Dextrex Degreaser with temperature controls, steam pressure regulator, 2 baskets, size 70" x 25" x 12". Purchased 1955, slightly used. Price $1200 total.
1—Rotary Lift Hoist. Model F5L2, purchased 1955, never used. Price $900.
1—PRE2 Ingersoll-Rand Air Compressor, 24 x 12½ x 14 stroke, 210 HP, 440 volt synchronous motor complete with exciter, Serial No. 40569-40570.
1—Type #25 Size 8000 CFH DX Surface Combustion Gas Generator purchased new in 1956. Price $5600.

ALBION MALLEABLE IRON COMPANY
ALBION, MICHIGAN

FOR SALE

1—46" x 76" Herman 6000# series charging conveyor type rollover and draw machine, complete with all clamps, vibrators, oil reservoirs, etc.
1—40" x 60" Herman heavy duty 15" solid cylinder jarring machine equipped with pattern stool and power lift conveyor.
1—Rollover Conveyor (rear discharge) with 4 auxiliary rolls.

AMERICAN HOIST & DERRICK COMPANY
63 SOUTH ROBERT STREET
ST. PAUL 7, MINNESOTA
Attention: R. M. Hansen

FOR SALE
SHOT BLAST EQUIPMENT

WHEELABRATOR AIR BLAST ROOM, complete with automatic shot handling equipment; dust collection system; and controls. Drive thru type, 14' x 20' x 8' high. Two hoses and fittings. New 1956, little used. Full set of drawings available. Located at Battle Creek, Michigan Plant.

CLARK EQUIPMENT COMPANY
BUCHANAN, MICHIGAN

FOR SALE
DETROIT ROCKING FURNACE

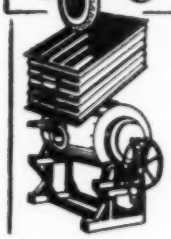
Type AA with cylindrical shell, 1200 lb. cold or 2600 lb. hot metal, complete with mechanical and electrical equipment, oil filled Kuhlman transformer, 11,000 volts primary, 125 volts secondary, 2800 amperes full load, installation drawings, unused and crated ten years. Ideal for alloy irons, brass or bronze. Price f.o.b. local cars $6,500.00. Address: HOPE ELECTRICAL PRODUCTS CO., 39 LONG AVENUE, HILLSIDE, N. J., ELIZABETH 4-7837.

FOR SALE

Patterns, tools, machines, jigs, etc. for making complete line of hand and windmill farm pumps. Will sacrifice for immediate sale. Address: THOMAS KICKLER, 824½ MAINE, QUINCY, ILLINOIS.

EUCLID FOUNDRY & MACHINE EQUIPMENT CO.

14919 SARANAC ROAD — CLEVELAND 10, OHIO



DUST COLLECTOR

1—Whiting Hydro-Clone, wet type, 4,000 c.f.m.
1—Detroit Uniwash

WHEELABRATORS

1—20" x 27", 2 cu. ft. Tumblast
1—4 ft. Tablast

MAGNESIUM CLEANING CABINETS

6—90" x 100" x 65" with exhausters, 8000 c.f.m.

MOLDING MACHINES (Automatic)

2—TDA4 Taccones

CORE OVEN

1—Di-Electric, Model CD-25 Coleman, 30 KW.

SAND SLINGERS

1—B-P Riddle type, 19" head, 4" tip
1—B-P Motive Jr., 19" head, 4" tip
1—B & P Dbl. Belt type, 19" head, 4" tip

SWING GRINDERS

10—10 H.P. Mummert-Dixon Model 1814
3—25 H.P. Safety Grinding Wheel Model 204

ELECTRIC FURNACE

1—350 lbs. Detroit Rocking

ASK FOR OUR COMPLETE LISTING — GLENVILLE 1-1222

UNIVERSAL REBUILT EQUIPMENT GUARANTEED

AIR COMPRESSORS
COMPLETE STOCK — BURY, PENNSYLVANIA, SULLIVAN, INGERSOLL-RAND —SEND YOUR REQUIREMENTS

BLOWERS
25—CENTRIFUGAL 16 oz., 2 to 5 HP
10—GE, WILBRAHAM - GREEN, FISHER Positive Pressure & Cent, Cupola Blowers

CLEANING EQUIPMENT & TUMBLING BARRELS
1—15" x 20" WHEELABRATOR Tumblast
1—20" x 27" WHEELABRATOR Tumblast
2—27" x 36" WHEELABRATOR Tumblast, one rubber belt, one steel conveyor
1—36" x 42" WHEELABRATOR Tumblast
1—48" x 42" WHEELABRATOR Tumblast,
1—24" WHEELABRATOR Swing Table
2—1-A WHEELABRATOR Multi-table with 6—26" aux. tables, 10—16" aux. tables
1—PANGBORN TABLAST 8' Table, 2500#
1—PANGBORN 6'LK Table Room
1—SLY, 68" x 32" Round
4—SLY, 48" x 36" Round

CONVEYORS
1—JEFFREY Car Type Mold, 23 cars, 109' track, cars 34" x 50"
1—HEWITT-ROBBINS Vibrating, 18" W x 10' L, Model VC-I
1—JEFFREY Ingot Mold, 3 compartment type 60' centers
1—LINK-BELT, CAR type mold, 114 cars, 403' track, car size 18" x 42"
1—SIMPLICITY, 24" x 10" Feeder w/hopper, Model OA-10-JA2

CORE BLOWERS
10—DEMMLER #1, #2, #2A, #3K, #4E
3—INTERNATIONAL 8B-13
3—OSBORN #91, #192, #91-10
1—RANDALL MODEL "A," Bench Type
1—TACCONE #4D, 10" Draw Stroke Cyl.

CUPOLAS
1—SKIP CHARGER for #9 Cupola with scale and buckets
1—WHITING Skip Charger for #5 Cupola
2—WHITING #7, 7 ton cap. Never used. Fraction of cost! Complete w/charger, blowers, etc. To be sold as one unit.

DUST COLLECTORS
COMPLETE STOCK—both Wet & Bag Type —send us your requirements

FURNACES—DIRECT ARC MELTING
1—250 lb. LECTROMELT, Side Charge
1—2000 lb. HEROULT, 3/60, 800 KVA
1—1½ Ton HEROULT
1—3 Ton LECTROMELT, Door Charge
1—3 Ton SWINDELL Hyd. Top Charge, 3000 KVA Transformer, Latest Type

FURNACES—INDIRECT ARC
1—350# DETROIT LFA
1—750# DETROIT LFY, Conical Shell
1—1000# DETROIT AA, 300 KVA
1—3000# Detroit C, 500 KVA

FURNACES—INDUCTION MELTING
1—3 KW, AJAX Lab type, steel
1—35 KVA, AJAX SPARK GAP, High Freq., steel
1—75 KVA AJAX, 2000# Brass
1—50 KW GECO, Steel

REBUILT & GUARANTEED

BEARDSLEY & PIPER

#70 Speedmuller

15 cu. ft. batch with Cooling and Skip Loader

FURNACES—GAS & OIL
1—225# Gas, hand tilt.
1—400# FISHER MNP, Gas Fired, Alum.
1—1000# STROMAN, Gas, Alum., hyd. tilt.
1—600# STROMAN, Gas, "U" Type
1—1200# Brass, MNP, Oil

FURNACES—HEAT TREAT
1—2' x 3' x 6', gas fired, 1800° F.
1—4' x 4' x 10' Gas Fired Annealing
1—9' x 12' Car Type, gas/oil
1—20" x 36" L&N Draw electric
1—32" x 78" L&N Vapocarb 83 KW
1—10" x 24" x 60" Gas, double end doors

MOLDING MACHINES
Jolt Rollover Pattern Draw
1—HERMAN 10,000#, 48" x 109" table
1—HERMAN 6000#, 42" x 78"
2—HERMAN 7500#, 40" x 50" tables
1—HERMAN 7500#, 40" x 60" table
1—HERMAN 3000#, 30" x 66" table
5—HERMAN 1500# to 30" x 48" tables
3—HERMAN 750#, 24" x 30" tables
2—INTERNATIONAL, 13" x 17" tables
1—J & J #1020, 50" x 60" table, 20" draw
2—J & J #815RB, 30" x 40" table, 1200#
1—OSBORN #602, 36" x 26", 900#
1—OSBORN #405, 3000#, flask size 64" x 57", 26" draw
1—OSBORN #42, 15" x 20", hand draw
4—TABOR 40" x 60", 1500 & 3000# capacity
2—TABOR 30" x 40" w/air clamps, 1000#
1—TABOR 22" x 42", pattern draw, shockless, portable, 600#
1—TABOR 20" x 30", w/air clamps, 1000#
2—TABOR 14" x 16" Rockover, 150#

Plain Jolt
2—DAVENPORT, table sizes 24" x 27", 30" x 30", 1200# to 1800#
1—INTERNATIONAL, 3' x 4' table, 12" cylinder

Jolt Pin Lift
1—HERMAN #4317, 22" x 30" table
1—J & J #681-C, 30" x 25" table, 600#
1—MILWAUKEE #1536, 32" x 38", 1500#
1—OSBORN #559, 25" x 30" table, 6" draw, 1200#
2—8PO #305, 750 lb., 20" x 27" table
1—TABOR 20" x 24" table, 600#

Jolt Squeeze Pin Lift
2—INTERNATIONAL, FKL, 18" x 24" table, 12" sq., 5½" draw, stat.
1—MILWAUKEE #126, 21" x 27" table, 12" sq., 1200#, 8" draw
2—MILWAUKEE #163, 15" x 24" table, 11" sq., 1500#
2—MILWAUKEE #165, 24" x 30" table, 16" squeeze, 1700#
5—OSBORN #712J, #712PJ, 18" x 28" table, 12" sq., 6" draw, stat. & port.
5—8PO #2114P, 21" x 27" table, 600#
5—8PO #2136G, 21" x 30" table, 800#

Jolt Squeezers
2—INTERNATIONAL #12 LJS, 16" x 20" table
4—INTERNATIONAL #10 LJS, 16" x 20"
1—NICHOLS #12 F-P, portable, 600#
31—OSBORN #275PJ, #275J, 17" x 20" tables, 10" sq., 400#, stat. & port.
2—OSBORN #276J, 17" x 26" table, 13" squeeze, 500# port.
2—8PO #110J, 17" x 20" table port.
1—8PO #113 J, 18½" x 26" table, 13" cyl., port.

MATERIALS HANDLING
1—BYERS, Mobile Crane, BUDA Engine, 50' Boom, 5 ton w/magnet & bucket
1—HOUGH PAYLOADER, Model HA, 1000# cap., hyd. lift, mech. dump

MULLERS AND MIXERS
1—B & P #70 Speedmullor, 15 cu ft batch with cooling and skip loader
1—B & P, Conventional, SIMPSON type, 87½" Dia. arranged for cooling
1—CLEARFIELD #404, 4' Dia, 4 cu ft batch
1—CLEARFIELDS #610, 6' Dia., 10-14 cu. ft. batch
5—SIMPSON #0, U.D. 3' Dia, never used
1—SIMPSON #1, U.D., 4' dia., 4 cu. ft. batch
1—SIMPSON #2, 6' U.D. Dia, 14 cu ft batch
1—SIMPSON #3, 8' Dia. Open Gear, 20-25 cu ft batch

LADLES AND POURING DEVICES
Bottom Pour
2—MODERN Crane Type, 55" H x 50" top
1—MODERN Crane Type, 60" H x 60" top
Lip Pour
1—WHITING 40" x 40" top dia. geared
1—WHITING 36" x 36", enclosed gearing
Cylindrical
8—WHITING, 26" L x 25" dia., 1100# iron
7—WHITING, 19" L x 22" dia., 600# iron
3—WHITING, 38" L x 28" dia., 2200# iron
Pouring Devices
11—WHITING, 650# to 2000# gross cap.

OVENS
1—COLEMAN Oil, 1 compartment, 14'6" L x 80" H x 5' W
1—COLEMAN, Oil, Drawer Type, 70" L x 57" H x 48" W
1—COLEMAN, Gas, 2 Comp. and 5 drawers, O.D. 22" x 12' x 10'
1—COLEMAN, Gas, 2 compartments, rack type, each compartment: 7' H x 8' W x 10' D
1—GENRICH, Elec., 3 drawer, preheating, auto-control, 9' H x 8' W x 6'7" L
1—GENRICH, Electric, Rack Type, 7' W x 7' H x 5'3" L
1—PORBECK, oil, 5 drawer core oven
2—ROSS, Gas, 2 compartment, recirc., rack type, 6½' x 14' x 7'

SAND CONDITIONING
1—B & P Nite-Gang
2—B & P Screenarator, Model "S" & "M"
1—LINK-BELT Revivifier
2—ROYER, NC-2, 10-15 tons/hr, 1½ HP
1—ROYER PREPARATOR, Comb. Model NDC, 25 ton/hr scrap removal, 8' x 8' hopper
3—ROYERS, NDP, 15-25 tons/hr, 2 Hp

SAND SLINGERS
1—B&P Stationary, Single Speed
2—B&P Tractor Type, 16" head
2—B&P Tractor Type, 19" head

SHAKEOUTS AND SCREENS
1—ROBINS Vibrating Screen, 36" x 78"
1—SIMPLICITY 50" x 116" shakeout
1—SIMPLICITY Vibrex screen, 3' x 8'

TESTING EQUIPMENT
1—500,000 lb. TINIUS OLSEN Hydraulic Compression Testing Machine
BRINNEL Hardness Testers, Manual & Motorized

MISCELLANEOUS
1—HOWE WEIGHTOGRAPH SCALE, Model 1700
1—KANE & ROACH WIRE STRAIGHTENER, Model DX-5
FLASKS CORE PLATES, All Sizes
1—CLIMAX Model 2-A Wire Straightener
10 or 15 HP GRINDERS Swing Frame
8—GRINDERS, Double End, Pedestal Type, U. S., Cin., Gardner, 5, 7½ & 10 HP

UNIVERSAL MACHINERY AND EQUIPMENT CO.

1632 N. Ninth St., Reading, Pa. Phone: FRanklin 3-5103

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AAA MACHINERY & EQUIPMENT CO.

over 1000 satisfied customers

WORLD'S LARGEST INVENTORY OF GUARANTEED FOUNDRY EQUIPMENT

AIR & ELECTRIC HOISTS

85—I & R Air Motor type, sizes LC3, A, B, C, D, D-6 & E, 300, ⅛, 1, 2, 3 & 5 ton.
15—DETROIT Air Hoists, 1, 1½, 5ton cap.
2—P&H and DETROIT Model LHR, 5 ton.
20—THOR air hoists, ⅛, 1 & 2 ton cap.

BUCKET ELEVATORS

12—LINK-BELT & JEFFREY, 30, 40, 50, 60 ft. cc, 10 x 7, 12 x 7, 14 x 7, 16 x 8 buckets.

CUT-OFF MACHINES

1—TABOR C10AF, 16" wheel, 10 HP.
3—TESSEMER H & I Sprue Cutters.

CORE BLOWERS

3—CHAMPION Model CB-10, CB-18, & CB-400. From 10 to 300 lb. Cores.
22—DEMMLER Model 1, 1E, 2, 2E, 2K, 3, 3E, 3K, 4 & 4E, 10 to 100 lb. Cores.
1—FEDERAL 40P-1 San-Blo.
7—INTERNATIONAL Model SB-11 & SB-13, SB-15H, 15 to 30 lb. Cores.
6—OSBORN Nos. 91, 92, 192 and 193. From 10 lb. to 75 lb. Cores.
3—MILWAUKEE #3A Bench Type.
2—REDFORD #2—Magazine type.
1—SAN-BLO Model CB-40-B, 40# Cores.
1—SPO Model SC-10-DM, hollow core.

CORE OVENS

1—INDUSTRIAL "Revolving Carriers" continuous, 18" x 80" trays.
1—THERMONIC Model M800A Dielectric. Cap. 900#s per hour.

CUPOLAS, BLOWERS & EQUIP.

1—SPENCER 150 HP 7500 CFM 48 oz.
6—I & R Centrifugal 30, 50, 85 and 100 HP. 3500 to 10,500 CFM w/blast gates.
1—MODERN No. 3½ Cupola.
1—CUPOLA Bondactor, style 1205-L.

ROTO-CLONES WET TYPE

9—AMERICAN AIR FILTER Type N&W, Sizes No. 20, 24, 27, & No. 30, w/sludge ejectors, cap. to 30,000 CFM.

ELECTRIC MELTING FURNACES

4—DETROIT LFA, 350# Cold Charge 700# Molten w/200 KVA transformers.
1—TOCCO 20 KW Induction, 9600 cycles.
3—AJAX No. 100 & 300 Furnaces Only.
1—DETROIT Size CM — 4000# Cold Charge, 8000# Molten, w/1000 KVA trans.
1—AJAX 50KW M.G. Set w/Furnaces—3000 cycle.
2—AJAX 20 KW Hi Frequency Converters.
1—TOCCO 75KW M.G. Set—9600 cycles.

GAS & OIL FIRED FURNACES

23—LINDBERG FISHER Model MNP electric Tilt. Sizes 150, 400, 600, 1000, 1700, 2000 & 2400#, alum. cap. Gas or Oil.
29—LINDBERG & HAUSFELD Stationary, Sizes 100, 150, 200 & 550 cap.
1—LINDBERG #400 BBI hand tilt.
1—LINDBERG #300, ATH, hand tilt.
1—SKLEENAR 1200# Rev., hand tilt.
1—MONARCH 600# Rev., hand tilt.
1—STROMAN, "U" 600# Reverb, Hand Tilt.
1—STROMAN DC "Dipout" 800# cap.
1—ECLIPSE E1000—Double Chamber Dry Hearth 1000# cap.

GRINDERS

Swing Frame

1—MARSCHKE 20" x 10" wheel, 10 HP.
3—MARSCHKE 24" x 3" wheel, 15 HP.
2—U. S. ELEC. Model 24, wheel 24" x 3".
1—MUMMERT-DIXON #2420, wheel 24" x 3".

Snagging

4—FOX #7—30" x 3" Wheel, 15 HP.
2—U. S. #64, 20" x 3", 7½ HP, 4 speed.
2—SAFETY #174, 24" x 3" wheel, 10 HP.
2—MARSCHKE 24" x 4" wheel, 20 HP.
1—U. S. #65, 30" x 3", 15 HP, 4 Speed.
U. S. No. 62VS, 24" wheel, 2-7½ HP motor, variable speed.

Core

2—MILWAUKEE 70-12, 70" dia. table.
1—STONEY Core Grinder, 16" dia. Wheel.

Horizontal Disc

GARDNER No. 124—52" wheel, 20 HP.
GARDNER No. 179, 70" dia. wheel, 40 HP.

LADLES

17—MODERN & WHITING Cylindrical Ladles, 275, 2450, & 3000 lbs. capacity, All Enclosed Gears.
37—MODERN & WHITING Lip Pour, Enclosed Gear, 1200, 1600, 2000, 4000, 6000, 7000, 8000 lbs. capacity.
7—MODERN & WHITING Mixing Ladles, 2 & 3 ton. Electric & Manual Tilting.

NATIONAL ENGINEERING CO.
2-ton sand reclamation system used to reclaim old sand to a new supply. Operated pneumatically with turbine-blower. In use 2 years. Can be inspected. Still installed.

MOLDING MACHINES

Jolt Squeezers

12—OSBORN No. 275-J—17x20 Table, 10"
15—OSBORN No. 276-J—17x26 Table, 13"
2—OSBORN No. 216-PJ—21-32 Table, 16"
6—MILWAUKEE 123—17x26 Table, 12"
2—MILWAUKEE 181—24x36 Table, 18"
10—INT. PVJS—17x26 Table, 12" cyl.

Plain Jolt

1—J&J 50 x 72 Table—5000# cap.
2—OSBORN 60" x 72" table, 6000# cap.
1—TABOR 36" x 36" table, 1000# cap.

Jolt Rollover Pattern Draw

1—DAVENPORT 28A, 28" x 44" table.
1—DAVENPORT 28-SA, 29" x 40" table.
3—HERMAN 1500 lb. Series, 26" x 48".
1—HERMAN 750 lb. Series, 20" x 30".
2—HERMAN 4000 lb. Series, 40" x 60".
14—INTERNATIONAL TYPE G, Sizes 20" x 8", 24" x 10", and 30" x 8".
2—J&J #612, 24" x 30" Table.
4—J&J #918, 44" x 54" Table.
1—J&J #815-B, 30" x 40" Table.
1—MILWAUKEE #167, 32" x 33" Table.
10—OSBORN #40 and 42 Core Rollovers.
1—OSBORN #442, 21" x 31" Table.
2—OSBORN #242W, 29" x 42" Table.
12—OSBORN #601 & 602, 30" & 36" Wide Flask, 10" draw, 750 lbs Cap.
2—OSBORN 643 Table 35" x 50"—2000#.
1—SPO No. 9546—26" x 32" Table.
1—SPO No. 917-A—40" x 29" Table.
1—SPO #413D, 24" x 25" Table.
1—SPO Model 508 table size 28" x 30".
1—SPO 5050, Table 25" x 30", 10" draw
3—TABOR 30" x 40" Table, 12" Draw.
4—TABOR 22" x 42" table, 10" Draw.

Jolt Pin Lift

3—INTERNATIONAL JDP 1600 x 10" draw 36" x 36" Table.
2—J & J No. 68S 25" x 30" table, 6" draw.
2—MILWAUKEE No. 1030—30x38 Table.
3—MILWAUKEE No. 3548—44x48 Table.
2—OSBORN #559, 25" x 30" table, 7" draw
1—SPO #3058, 22" x 28" table, 8" draw
2—SPO #3070, Table 26" x 35", 10" draw
1—TABOR, 22" x 32" table.

Pin Lift

2—B & P Model AL 2428 Speed Draw.
1—MILWAUKEE #620 ND Push

Jolt Squeeze Pin Lift

1—MILWAUKEE #125, 21" x 27" Table.
3—MILWAUKEE No. 165, 24" x 30" table.
3—MILWAUKEE #196, 17" x 38" Table.
1—OSBORN #712-V, 18" x 26" Table.
2—OSBORN #710-J, 17" x 21" Table.
9—OSBORN 714PJ, 20" x 31" Tables.
1—OSBORN 716PV, Table 22" x 34", 16" cyl.
1—OSBORN #618—24x36 Table, 18" cyl.
1—MILWAUKEE #246—23¼x42 Table, 24" cyl.
4—INTERNATIONAL PKL, 17" x 26"
2—SPO 2114P, Table 21" x 27", 11" cyl.
2—SPO 2160-R, Table 24" x 30", 16" cyl.

Shell Molding

1—SHALCO, Model HO4, 2 station.

CONVEYORS

Steel Apron

9—JEFFREY & LINK-BELT 24", 30", 36", widths. Lengths built to your specifications, with reducers & motors.

Oscillating & Vibrating

1—HEWITT-ROBBINS 24" x 120'—7½ HP.
1—LINK-BELT 48" x 154', 20 HP Motor.
7—JEFFREY TAYLOR No. 5 Vibrating Feeders 24" wide x 7'.
LINK-BELT "FLEXMOUNT"
1—8" W x 50' L x 4" deep pan
1—12" W x 21' L x 4" deep pan
1—12" W x 26' L x 4" deep pan
2—18" W x 18' L x 4" deep pan

Roller

2500' MATHEWS 6", 12" wide, 2 7/16" dia. roller, 1¼" hex shaft, 4" channel.
1500—MATHEWS 8" x 12" wide, 3½" dia. 1" hex shaft on 6" centers, 6" channel.

Mold

1—DUO-ROLL 88 Cars 20" x 48", 350' track with automatic dumping.
1—PALMER "B" 106 Cars—42" x 62" w/550' Track.

Belt

LINK-BELT & JEFFREY 18", 24" & 30" wide. Flat or trough idlers, all Timken bearings. Built to your specifications. Can be equipped with molders hoppers & Ploughs.

HOPPERS & STORAGE BINS

7—NATIONAL & LINK-BELT Storage Bins, 60 to 150 tons cap.
1—NEWAYGO HS-7-GT, Handy Sandy.
42—MOLDERS Hoppers 1½ ton cap.

SAND MULLERS

1—B&P #30 Speedmullor 4 cu. ft. w/Loader.
1—B & P #60, Speed Muller, 12 cu ft.
2—B & P #70, Speed Mullers, 18 cu ft.
1—BESSER Paddle Type, 30 cu. ft.
1—CINCINNATI 24" muller.
2—CLEARFIELD No. 610 w/skip hoist loaders, 10 to 14 cu ft batch.
1—CLEARFIELD #404, 4 cu. ft. batch.
1—DRAVO-DOYLE 6 cu ft cap. Port.
1—LINK-BELT 48" x 8' Paddle Type.
1—PEKAY No. 160-1-24 Mixer Muller, single stage for 24" belt, 230 TPH.
1—SIMPSON #0, style C, 175 lb.
2—SIMPSON #2, Style C, 1500# w/loader.
3—SIMPSON #3, Style C, 3000 lb.
3—SIMPSON #3, Style UD, 3000 lb.
2—Mixer Muller 6 cu ft paddle type.
1—LANCASTER No. EDG-4, 5 cu. ft.
1—LANCASTER #EA-4, 6 cu. ft. w/loader.

SAND PREPARATORS

6—B & P Screenerators, Models S, M & L.
8—ROYER Models, NC-4, NDS, NDP.
6—AMERICAN Sand Cutters, Model M, Sizes 79/60, 89/70, 99/80. All late.
4—AMERICAN Model AA and AM, 45" & 60" Cutting Blade.
1—AMERICAN "Sand Master," 102"/70" Cutting Blade—1952.
2—MOULDERS' FRIEND 50" & 60" Brush.
2—NEWAYGO RS-V Reddy Sandys.
1—SIMPLICITY LP 2' x 3' screen.

SANDSLINGERS

1—B & P Motive Jr., 300 cu ft tank.
2—B & P Tractor Type 19" head & 16" head, 13' arms. Magnetic towers.
6—B & P Models DB Stationary Sand Slingers, 16", 19" and 22" heads, with 20, 25, 40 and 50 HP motors. All late.
2—B & P Swing Type Slingers 19" head.
4—B & P 8 ton plate feeders.
2—B & P 35 ton capacity plate feeders.
6—B & P Tanks for speed slingers.
1—B&P Motive 15' Jib—6' Ram—19"—25 HP.
1—B&P Motive Jr. 8' Jib—4' Ram—19"—25 HP.

SHAKEOUTS & SCREENS

1—ALLIS-CHALMERS 5' x 8', portable.
2—LINK-BELT 5' x 10', 6 ton cap.
3—SIMPLICITY 4' x 6' Model B.
1—SIMPLICITY 4' x 8' Model D.
1—SIMPLICITY 4' x 10' Model D.
1—SIMPLICITY 5' x 8', Model D.
1—NATIONAL ENG. 5' x 8' Hex Screen.
1—HEWITT-ROBINS 36" x 78" Vibrex.
1—SIMPLICITY 4' x 10' Model B, Single deck sifter screen, 10 HP motors.
2—ROBBINS 3' x 4' JF6—2000#.
2—ROBBINS 3' x 5' JF6—2000#.
1—ROBBINS 6' x 10' JF11—20,000#.

SAND BLAST EQUIPMENT

2—AMERICAN 36" continuous Tumblasts
1—AMERICAN 20" x 27" w/dust collector.
1—AMERICAN 36" x 42", w/skip hoist.
2—AMERICAN 48" x 42", w/skip hoist.
1—AMERICAN 27" x 36", w/skip hoist.
1—AMERICAN 48" x 48", w/skip hoist
1—AMERICAN 48" x 72" w/loader.
1—AMERICAN #3 Tablast 4—48" tables.
1—AMERICAN #1 Tablast 7-14" tables.
1—PANGBORN #45 type MT Sand Blast Room 10' L x 8' W x 6' H.
1—PANGBORN Model 6-LF, 6' diameter plain table with dust collector.
1—PANGBORN 6 LG-14 Multi-Table, 6-24" tables, w/dust collector.
1—PANGBORN Model 14GK-7 Roto-Blast barrel w/loader.
1—PANGBORN 9LG-14 Multi-Table w/6—36" dia. Aux. Tables w/Dust Collector.

AAA MACHINERY & EQUIPMENT CO.

10900 CEDAR ROAD—CLEVELAND 6, OHIO—CALL SW 1-3900

Circle 879 on Page 53

THE ACME BARGAIN PAGE

AERATOR
NEWAYGO

AIR COMPRESSOR
6 x 7 INGERSOLL-RAND

BELTING
29" x 180' 24" x 152'
24" x 263' 24" x 120'

BLOWERS
INGERSOLL-RAND 13,000 cfm, 32 oz., 150 hp., 220 V
GE 10500 cfm., 20 oz., 85 hp., 220 V.
GE 7500 cfm., 20 oz., 89.6 hp., 220-440 V.
GE Centrifugal 6200 cfm., 24 oz., 58 hp. motor
NORTH AMERICAN 1050 cfm, 16 oz.
SPENCER 7350 cfm, 16 oz., 50 hp.
SPENCER 2250 cfm., 16 oz., 15 hp., 220 V.
SPENCER 270 cfm., 8 oz., 3 hp., 220-440 V.

CLEANING EQUIPMENT
Model 4836V-B VAPOR BLAST

CONVEYOR OVERHEAD CHAIN
1400' JERVIS B. WEBB and LINK-BELT #678 with trolleys 36" centers. 2-5 hp. Variable speed caterpillar drives, take-ups and turns.

CONVEYOR
17' BARBER GREEN Bucket Conveyor
30" x 25' Magnetic Belt Conveyor w/drives, 2 hp., 220-440 V.

CORE BLOWERS
DEMMLER #2, 20# cores
DEMMLER #2K, 20# cores
REDFORD Bench types, horizontal or vertical clamping
CB18 55# cores, Universal blow plate
C.B. 10 up to 12# cores, 4¼" draw
DEMMLER #4 up to 250# cores
FEDERAL "SAN-BLO" CB 40
INTERNATIONAL 8B18H, up to 150# cores. Hydraulic clamp and draw
INTERNATIONAL 8B 13, up to 60# cores
INTERNATIONAL 5B 12, medium sized cores
INTERNATIONAL 8B 11, medium sized cores
6—OSBORN 193 up to 50# cores
OSBORN 2035-2 large sized cores

CORE GRINDERS
5—MILWAUKEE 70-9 & 70-12s
1—OWOSSO DE1-303 42" table

CORE OVENS
THERMONIC INDUCTION MODEL 1800A
5—DESPATCH, Gas Fired, 3 Drawer

CORE ROLLOVERS
INTERNATIONAL REDP Rollover 12" draw
B & P CR 20-10
SUTTER SP 500F

CRANES
P&H 3 TON Electric Traveling DC motors 50' span
270' Crane Runway and Supports
10 ton MILWAUKEE; 48' span, 220 V.

CUPOLA GUNS
1—BONDACTOR #1250
BONDACTOR #1000

DIE CASTING
2—LAKE ERIE 800 ton Aluminum 58" x 89" die plates; 9# shot

DUST COLLECTORS
PARSONS 40,000 cfm. cloth bag type
ROTO CLONE, Size 6, Wet Type, 3000 cfm

ELECTRIC MELTING FURNACES
SINGLE PHASE
1—DETROIT "LFA" 350# shell 13200 V.
1—DETROIT "LFC" 700# & 350# Tapered Shell 2300 V.

FLASK HOIST—ROLLER CONVEYOR
NATIONAL 24"; 8' long table

FURNACE TRANSFORMERS
1—"LECTROMELT" 800 KVA, 12000 V., 3 phase
1—WESTINGHOUSE 500 KVA, 11200 V., 3 phase
1—WESTINGHOUSE 2500 KVA, 13800 V., 3 phase

FURNACES NONFERROUS
CAMPBELL HAUSFELD Staty. pot type
1—HEVI-DUTY HD-181-S Pot type, Electric
2—400# FISHER Gas Fired Tilting Furnaces
4—600# FISHER Gas Fired Tilting Furnaces
1—600# FISHER Gas Fired Stationary Furnace
FISHER RB100 Gas Fired Crucible
2—CAMPBELL HAUSFELD Oil Fired 625# brass hand tilt
1000# STROMAN DC double dipout w/complete controls

GRINDERS, SNAG
FOX 24" x 2" Single Wheel 10 hp.
1—HAMMOND 24" x 2" x 12" 7½ hp., 220 V.
HAMMOND WR-2, 2 speed, 30" x 3" wheel

GRINDERS, SWING FRAME
MARSCHKE 24" x 3" x 12" 20 hp., 220 V.
U.S. 24" x 3" x 12" 15 hp., 220-440 V.
2—MARSCHKE 3 hp., 12" wheel
1—B&D 7½ hp.

GRINDERS, MISC.
U.S. #70 Combination 20" disc and 20" x 3" x 1¼" wheel

HEAT TREATING FURNACES
HOLDEN #202 Electrode Type, Bright hardening annealing 1850°
LINDBERG 48" x 48" x 72" Elec., 1250°, box type
BELLEVUE Gas Fired Annealing 20' x 48" x 18"
HAGAN Oil Fired Annealing 18'3" x 3'3" x 18" high

HOISTS
10 ton SHAW BOX electric hoist
4—INGERSOLL-RAND Air trolleys
1—500# INGERSOLL RAND LC-4
4—CLEVELAND 2000# Cab type hot metal carriers

LADLE MIXING
4000# Industrial, Insulated

MOLD BLOWER
TACCONE TD4 24" x 32" flask

MOLDING MACHINES JOLT SQUEEZE PIN LIFT
3—#165-6B MILWAUKEE table, 24" x 30"
2—OSBORN 712 PJ, 18" x 21" table
1—CHAMPION JSL10P 18" x 21" table 6" draw
2—#2114 G. SPO table, 26" x 27"—11" cyl.
2—OSBORN 712 PV
MILWAUKEE #3548-6; 48" x 44" Tbl.; 12" Draw
MILWAUKEE #2542-3; 38" x 42" Tbl.; 12" Draw

SPECIAL! FACTORY REBUILDING
8—MILWAUKEE 2646 Jolt Squeeze Strip rolloff — rolling molding machines 10" jolt cylinder; 1800# capacity, 26" Squeeze cylinder; 13" draw. Flask size 25¼" to 29" wide, 52" long. New 1951. WILL BE FACTORY REBUILT.

JOLT SQUEEZERS
2—INTERNATIONAL, LJS12 18" x 20" table
4—CHAMPION, JS10P 18" x 21" table
2—OSBORN 275PJ
MILWAUKEE 214—Jolt Squeeze car type
2—MILWAUKEE 244 Jolt Squeeze car type head
MILWAUKEE 181-7, 24" x 36" table

JOLT ROLLOVER DRAWS
2—750# HERMAN 20" x 30" table
1—INTERNATIONAL RJ 20" x 12"
3—SPO 9032

JOLT PIN LIFTS
2—INTERNATIONAL 1200-S 26" x 27" table, 8" draw

PIN LIFT PUSHOFF
MILWAUKEE 620ND 20" x 24" table

MULLERS and MIXERS
2—#1 SIMPSON Mullers
B & P #30 w/skip loader; multrol heating, cooling blower.

SAND CUTTERS
1—ROYER MCZ-43

SAND SLINGERS
1—B&P Tractor, 19" heads
B&P 2 speed 40/25 hp. double belt

SAND SYSTEMS
2—NEWAYGO SUPER HANDY SANDY; like new

SAWS, BAND
30" LAIDLAW, Metal Cutting hydraulic feed
42" TANNEWITZ, 5 hp., 220-440 V.

SAWS, CUTOFF
DELTA Abrasive cutoff

SHAKEOUTS
3' x 5' ROBBINS
3' x 5' SIMPLICITY
5' x 6' SIMPLICITY
4' x 10' SIMPLICITY

SHOT BLAST
SLY #4, 20" x 20" w/dust collector

SPRUE CUTTERS
2—PERKINS #53 1¼" stroke
1—MILWAUKEE #55 TON

TESTING EQUIPMENT
ARLIN Automatic Rockwell, continuous type
COLEMAN 55 Spectrophotometer
GOGAN Model 1414-2V
TYLER ROTAP Testing Sieve w/screens

TUMBLING BARRELS
1—ROYERSFORD, 42" x 72", chain drive, late
WHITING 60" x 72" 20 hp. drive
SLY, 24" x 42"; 3 H.P.

WHEELABRATORS
1—42" x 48" AMERICAN Skip Loader
AMERICAN #2 Tumblast S-2's" tables, late
2—HOLLINGSWORTH 44" x 48" Wheelabrators

WOODWORKING—PATTERNSHOP
GARDNER 30" DISC and Spindle Sander
JONES SUPERIOR 48" Double Disc
BOICE CRANE 12" Planer
2—OLIVER 182D, 15" Disc Sanders
1—WALLACE 8" Jointer
1—CRESCENT 24" Planer
TANNEWITZ 42" Band Saw
ONSRUD W-244 & W-240 Routers
GREENLEE #495-S Tilting Arbor Saw
8", 12" and 30" Jointers
16", 32", 36" Band Saws

WIRE STRAIGHTENERS
2—#2A CLIMAX ¼"

ACME

ACME EQUIPMENT CO., INC.

We will buy for cash a single piece of equipment or your entire plant

126 South Clinton Street • Phone: ANdover 3-3430 • Chicago 6, Illinois

MONA

CLASSIFIED ADVERTISING RATES

(Effective July 1, 1956)

POSITION WANTED—Minimum advertisement set solid, 30 words or less, $3.50. Additional words 15c each.

ALL OTHERS — "Help Wanted" — "For Sale" — "Wanted-To-Buy", etc., minimum advertisement set solid, 30 words or less, $8.00. Additional words 30c each.

NOTE—If replies are to be sent to a box number in care of FOUNDRY, add 8 words to your advertisement for box number and address.

Any advertisement set in all capital letters, add 50% to the above rates.

INCH RATES PER INSERTION

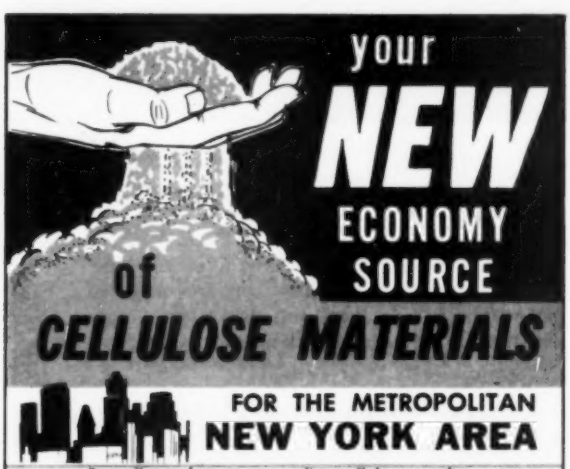
Single Column 2¼" Wide	One Time	Three Times	Six Times	Nine Times	Twelve Times
1 inch	$ 22.20	$ 21.00	$ 19.80	$ 19.20	$ 18.60
2 inches	43.20	40.80	38.40	37.20	36.00
3 inches	63.00	59.40	55.80	54.00	52.20
4 inches	81.60	76.80	72.00	69.60	67.20
5 inches	99.00	93.00	87.00	84.00	81.00
6 inches	115.20	108.00	100.80	97.20	93.60
7 inches	130.20	121.80	113.40	109.20	105.00
8 inches	144.00	134.40	124.80	120.00	115.20
9 inches	156.60	145.80	135.00	129.60	124.20
10 inches (1 col.)	168.00	156.00	144.00	138.00	132.00
15 inches (½ page)	243.00	225.00	207.00	198.00	189.00
20 inches (2 cols.)	312.00	288.00	264.00	252.00	240.00
30 inches (full page) ..	450.00	414.00	378.00	360.00	342.00

Remittance should accompany advertisement when submitted —Cash Discount 2%, 10 days.

Classified Forms Close the 13th of Month Preceding Issue

FOUNDRY

PENTON BUILDING • CLEVELAND 13, OHIO



your NEW ECONOMY SOURCE of CELLULOSE MATERIALS

FOR THE METROPOLITAN NEW YORK AREA

Buy direct these two quality cellulose products at substantial savings from one of America's leading processors. No more large inventories or heavy freight charges for foundries within 200 miles of New York City.

MAIZE--X

Precisely ground from corn cobs. Provides maximum flowability with uniform hardness — reduces scabs and buckles. Gives superior shakeout with increasing collapsibility.

WOOD--X

100% maple woodflour of uniform texture with controlled moisture content. Gives decreased hot strength at 1000° F. Substantially increases core-gas volume and green compression strength of sand.

Test the exceptional performance of these two products in your own foundry by writing for Free Samples today.

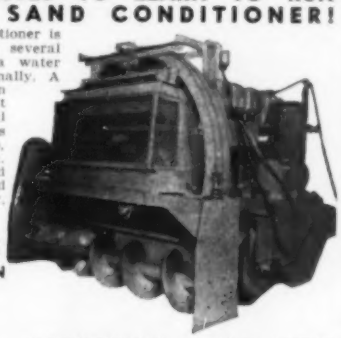
MICHAEL WOOD PRODUCTS INC.

650 Midland Ave.
Garfield, N. J.
PRescott 3-8000

Circle 700 on Page 53

ONLY 10 MINUTES TO LEARN TO RUN A RINGLIFT SAND CONDITIONER!

The Ringlift Sand Conditioner is simple to operate—only several buttons to push and a water valve to adjust occasionally. A man can learn to run it in 10 minutes. However, it does the work of several men and machines. Picks sand off floor, screens, cools, mixes and wets it. Removes scrap iron, hard lumps, etc. Deposits sand in neat windrows, quickly. Send for literature.



STATES ENGINEERING CORPORATION
245 E. Murray St.
Fort Wayne, Indiana

SAND PREPARATION • MECHANIZATION • PLANT LAYOUT

Circle 701 on Page 53

FOUNDRY

EDWIN S. CARMAN, INC.

LEE ROAD AT MAYFIELD
CLEVELAND 18, OHIO

A COMPLETE FOUNDRY SERVICE

CONSULTANTS

Circle 702 on Page 53

FAMOUS FALLACIES *about industrial advertising*

Advertising leaves less money for profits

J. H. Jewell refutes this one...

Mr. J. H. Jewell, vice president in charge of marketing, Westinghouse Electric Company, says: "*Well-planned industrial advertising is a cause — never just a result — of sales and profits. In today's economy the quality of communications in selling is as important as the quality of production equipment.*"

Progressive managements realize they must make effective use of all the channels of communicating with markets — salesmen, publication advertising, direct mail, trade shows, catalogs, films — if enough products are to be sold to insure full-scale employment and full use of production facilities.

Advertising has been proven to be the lowest-cost way of making up people's minds. It reaches more people, more often, with *carefully-controlled* messages.

When salesmen call on people who have been preconditioned by advertising, their task is easier, their own efforts more effective.

That is why more and better industrial advertising leads to a greater share of market preference — and greater profits.

NATIONAL INDUSTRIAL ADVERTISERS ASSOCIATION, INC.

271 MADISON AVENUE, NEW YORK 16, NEW YORK

An organization of over 4000 members engaged in the advertising and marketing of industrial products, with local chapters in ALBANY, BALTIMORE, BOSTON, BUFFALO, CHICAGO, CLEVELAND, COLUMBUS, DALLAS-FORT WORTH, DENVER, DETROIT, HAMILTON, ONT., HARTFORD, HOUSTON, INDIANAPOLIS, LOS ANGELES, MILWAUKEE, MINNEAPOLIS-ST. PAUL, MONTREAL, QUE., NEWARK, NEW YORK, PHILADELPHIA, PITTSBURGH, PORTLAND, ROCHESTER, ROCKFORD, ST. LOUIS, SAN FRANCISCO, TORONTO, ONT., TULSA, YOUNGSTOWN.

NON-FLUID OIL

TRADE MARK REGISTERED

Best for Shake-out Bearings

F-#925 and S-#58-M grades of NON-FLUID OIL have been specifically designed for shake-out lubrication. They have super-adhesive properties and stay in bearings, protecting against friction long after ordinary greases have been "knocked out". F-#925 and S-#58-M grades of NON-FLUID OIL outlast ordinary greases three to five times. Leading shake-out manufacturers recommend initial and continued use of NON-FLUID OIL. Don't take our word for this—we will be happy to supply their names upon request.

Test NON-FLUID OIL at no obligation to you. Send today for free samples of F-#925 or S-#58-M grades and Bulletin No. 559.

●

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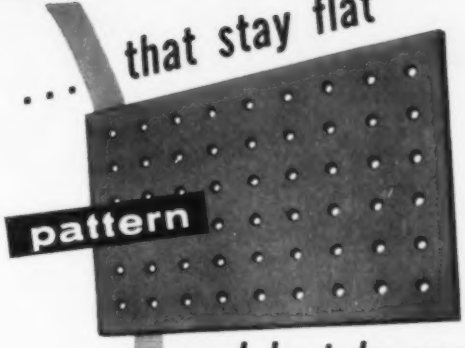

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Port Washington, Wisconsin

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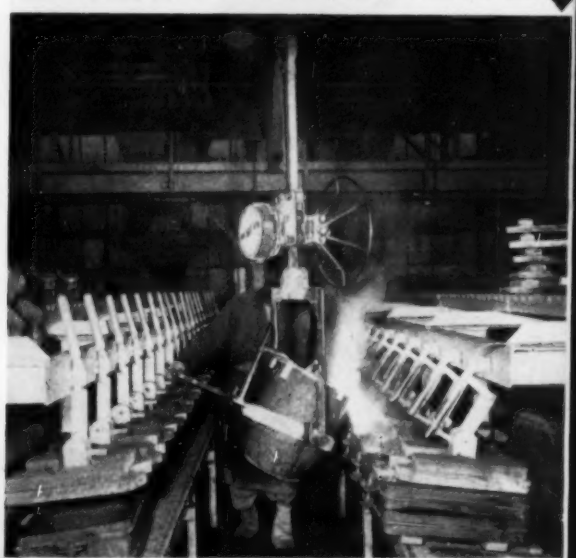

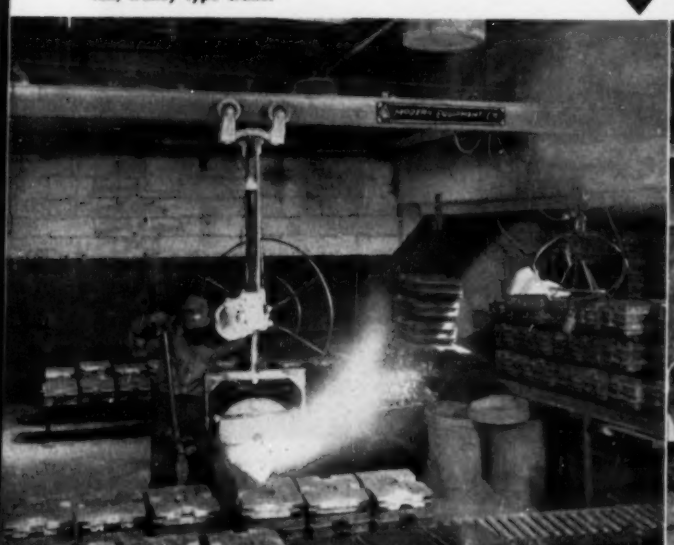

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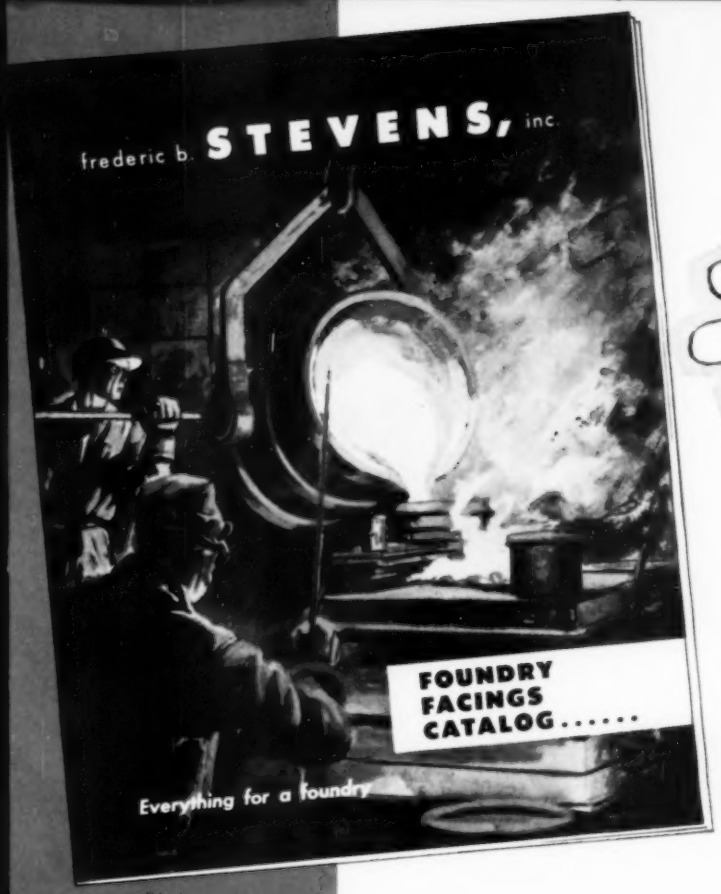

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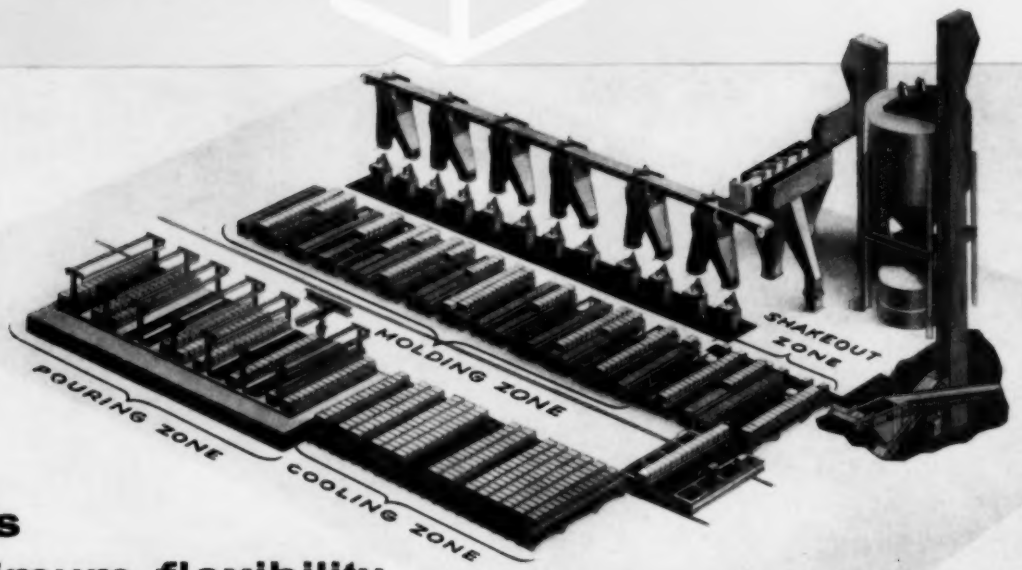

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